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SUMMARY OF RECENT ABSTRACTS*

I. CHOLERA†

General: Epidemiology

The SEATO Cholera Research Project report (p. 1058) contains a proposal for a comprehensive programme involving physiological, epidemiological and bacteriological studies, to be undertaken in Thailand with assistance from the United States.

SEAL (p. 1059) discusses the epidemiology of cholera in India; the endemic areas are in deltas, usually within 100 miles of the sea, the water has a high saline content and a high *p*H, the population is dense and the people eat rice, the temperature and humidity are high. Movement of the people is important, especially aggregation in fairs and festivals. The author gives information on past outbreaks and makes suggestions for control; with his colleagues he (p. 1060) describes the epidemiology of cholera in Calcutta.

CHATTERJEE and DAS GUPTA (p. 32) comment on cholera in Calcutta, which has been associated with a dual water supply—one of filtered and chlorinated water for domestic use, but distributed in old and damaged pipes, and one direct from the contaminated river for non-domestic purposes. Cholera vibrios have been found in the river water. Long-term proposals for control involve improved water supply and sewerage, and slum clearance, but as interim measures the authors suggest mass immunization of the people in the epidemic season and every 6 months afterwards. An account of the epidemiology of the disease in certain parts of Calcutta is given by ROY (p. 32).

ABOU-GAREEB (p 33) found *Vibrio cholerae* in the water of ritual ablution tanks of a mosque in Calcutta shortly after a religious service. It was not possible to decide whether the infection came from persons precociously excreting the organisms, or from convalescent carriers, but this may evidently be one way in which the infection is spread. He (p. 593) found evidence which connected one case of cholera in Calcutta with the consumption of water from

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1960, v. 57. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on cholera in this series, see the January issues of the *Tropical Diseases Bulletin* each year since 1939.

a shallow well shown to be contaminated with true cholera vibrios. He (p. 905) examined water from the River Hooghly and its canals in Calcutta, by filtering 2½–5 litres through Kieselguhr pads and culturing the pads on enrichment media. *V. cholerae* were recovered fairly evenly over the epidemic and inter-epidemic periods, and he notes that the disease is in fact found throughout the year.

In discussing cholera in Calcutta ABOU-GAREEB (p. 905) remarks that successful isolation of pathogenic vibrios seems to depend on the early collection of stool samples soon after the onset of the disease. Cholera appears particularly to affect persons of 35 and over, especially those of low economic status, many of whom are food handlers. Factors favouring spread are constant migration to and from places outside the city, poor water supplies, overcrowding and deficient sanitation. He (p. 472) extended his observations to a village near Calcutta where water was taken from tube wells but where ponds were used for washing. Clinical cholera had not been seen for 2½ years, but examination of stools revealed Inaba vibrios in members of one family, the carrier being a man who travelled frequently to a neighbouring town. Inaba vibrios were also isolated from local ponds. 2 months later the carrier was not passing these Inaba vibrios, but they were then found in a neighbour. A serological survey revealed a high proportion of villagers with antibodies to Inaba or Ogawa vibrios.

ABOU-GAREEB (p. 1061) examined cattle dung in Calcutta and a village in Bengal, but did not find *V. cholerae*, and he (p. 32) gives an account of an outbreak of cholera in Katmandu, Nepal, in 1958, where shallow wells, contaminated river water, and possibly certain foodstuffs open to contamination by flies, were suspected.

RANANAVARE *et al.* (p. 121) refer to an explosive outbreak in Poona in which all the 29 strains of *V. cholerae* isolated except one were of Ogawa type; one El Tor vibrio was isolated.

LEARMONTH and PAL (p. 91) plotted 2 variables of cholera—prevalence and variability—on a map of the state of Mysore and were able to decipher 7 epidemiological types, each of which can be related to some probable causative factor leading to high endemicity—for instance the periodical celebration of a fair or a large irrigation project.

During the epidemic of cholera in Bangkok in 1958 HALE *et al.* (p. 907) observed many flies in aircraft and airports. They collected flies from a number of aircraft and isolated faecal organisms from them, but not *V. cholerae*. Contamination within the aircraft was unlikely, but there is evidently a risk of air transmission. Insecticide spraying during flight was instituted.

Aetiology

OUCHTERLONY (p. 121) discusses media for the transport and isolation of *V. cholerae*, comparing buffered sea salt solution, alkaline peptone water, Aronson's agar and starch-tellurite agar.

FINKELSTEIN and LABREC (p. 704) show that the fluorescent antibody technique can be applied for the recognition of *V. cholerae*, though non-specific reactions may confuse the issue when the concentration of vibrios is small. In such cases, inoculation into alkaline peptone broth provides within 9 hours cultures which give with certainty the specific staining reaction.

MUKERJEE *et al.* (p. 122) found phages of 4 types in stools of cholera patients in Calcutta, and were able to type almost all of 600 strains of *V. cholerae*. There

was no correlation between serological and phage types, but the epidemiological value of phage typing was confirmed in a few localized outbreaks where cases could be traced to a single source. NIKONOV *et al.* (p. 1061) observed that though propagation of cholera phage in broth cultures of *V. cholerae* was unsatisfactory, propagation in bile preparations, or in ligated intestinal loops, gave much better results.

Although attempts to enhance the virulence of degraded stock strains of *V. cholerae* by intraperitoneal passage in guineapigs proved to be inconstant, NIKONOV *et al.* (p. 122) succeeded by cultivating them in isolated loops of the small intestine of guineapigs or rabbits. FORMAL *et al.* (p. 1061) observed that a purine-independent mutant strain of *V. cholerae* was more virulent for mice (but not guineapigs) than the parent strain which required purine, and that the purine-requiring strain became more virulent if purines were injected along with the challenge organism.

Various toxins have been reported as derived from *V. cholerae* but their relationships and importance are not clear; JENKIN and ROWLEY (p. 123) have isolated toxic protein fractions from standard strains and from water vibrios, and these accounted for most of the toxicity of the whole organism. They discuss the relationship between this protein toxin and the toxin isolated by FRETER [this *Bulletin*, 1957, v. 54, 681].

JENKIN and ROWLEY (p. 242) inoculated various toxic fractions of *V. cholerae* into ligated loops of rabbit small intestine, but they did not produce fluid distension (such as is produced by living cultures) unless 20 mgm. or more of sodium lactate was also injected. Moreover, this reaction is not produced by living cultures which do not lead to the production of sufficient lactic acid, and the production of this acid by fast-growing organisms appears to be the most important cause of fluid distension and haemorrhagic necrosis in cholera. These authors (p. 704) show that the usual reaction which follows injection of growing cholera vibrios into ileal loops of rabbits does not occur if the animals have been immunized with heat-killed vaccine, or have received anticholera serum. This protection is specific, and antibodies are found in the lumen of the ileum. These sensitize the vibrios so that they can be ingested by macrophages. The antibody against the lipopolysaccharide component of the O somatic antigen is concerned in this protection. JENKIN (p. 594) shows that the protein component of the Boivin antigen of *V. cholerae* and water vibrios is identical with the toxic protein isolated from the whole organism. The protein toxins of the various vibrios have some antigenic relationship but the lipopolysaccharides are type-specific; they resemble those of other Gram-negative bacteria in their biological properties and account for the immunological specificity of the O-antigen complex.

DUTTA *et al.* (p. 124) prepared a toxin from Inaba strains of *V. cholerae* by the method of Gallut, and observed that it produced diarrhoea and death when given by mouth to very young rabbits. DE *et al.* (p. 906) show that the enterotoxic factor of *V. cholerae* appears to be unrelated to mucinase or haemolysin production, and they suggest that both exotoxin and endotoxin play a part in the pathogenesis of cholera.

GHOSH and MUKERJEE (p. 593) distintegrated cholera vibrios by ultrasonic vibration and separated soluble and insoluble extracts. These were toxic for mice, guineapigs and rabbits, but irregularly, and the ligated intestinal loop test was negative. The skin-reacting factor of the living vibrio was present

in the soluble extract. Suspensions of disrupted *V. cholerae* have been shown by MISRA and SHRIVASTAVA (p. 1062) to contain 7 antigens as differentiated by the agar gel diffusion technique; one was heat-stable and the rest were heat-labile.

KHUDANOV *et al.* (p. 34) show that horses and rabbits immunized with *V. cholerae* develop antibodies for both *V. cholerae* and *Brucella*, and they argue therefore that *Brucella* antibodies in such horses should not be taken as evidence of brucellosis.

The World Health Organization (p. 699) has issued a report of a study group on the requirements for several types of vaccine, including cholera vaccine, for which new potency tests are described.

GOTO *et al.* (p. 906) discuss the purine requirements of the El Tor vibrio.

Clinical Features: Treatment

In the acute stage of cholera there is a significant rise in serum gamma globulin without alteration of albumin and therefore without abnormal turbidity tests; in the uraemic stage the main abnormality is in the alpha globulin, which is related to destructive lesions (SENGUPTA *et al.*, p. 242). BENYAJATI *et al.* (p. 1062) show that renal failure in cholera is due to acute tubular necrosis resulting from anoxia from failure of renal blood flow, and not from toxaemia. They discuss potassium replacement therapy and the management of renal failure.

MORGAN *et al.* (p. 808) review the treatment of cholera based on the experience of the Bangkok epidemic of 1958. They point out that severe cholera still carries a case-mortality of 60%. They discuss fluid replacement with normal saline containing sodium bicarbonate and potassium chloride (for acidosis and hypokalaemia), and they note that antibiotics or sulphonamides are not helpful. Details must be sought in the original abstract. *Charles Wilcocks*

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control;* Animal malaria—*monkeys, other animals, birds.*

SIMITCH, T. Le paludisme en Yougoslavie, jadis et maintenant. [**Malaria in Yugoslavia, Then and Now**] *Riv. di Parassit.* Rome. 1960, June, v. 21, No. 2, 81–6, 1 fig.

Up to the outbreak of World War II, malaria was one of the most prevalent diseases in Yugoslavia, the incidence ranging from 600,000 to 1,200,000 cases annually. The regions most affected were Macedonia, Dalmatia and Montenegro, where infections with *Plasmodium falciparum* formed 33 to 42% of the total. Spleen indices varied from 45 to 95% and parasite indices from 35 to 75%. The principal vectors were *Anopheles maculipennis* and *A. superpictus*, with *A. sacharovi* taking part in transmission in the south Adriatic coastal region.

Before 1947, attempts were made to control malaria by quinine, mepacrine and pamaquin, supplemented in selected areas by antilarval measures. Mortality from malaria was thereby reduced, but there was little change in the general endemic picture. From 1941 to 1945, when the country was under German occupation, there was no organized system of control. There was a general increase in malarial incidence and outbreaks occurred in a number of areas which had previously been free from malaria. These were largely attributable to the influx of refugees from the more malarious regions.

An insecticidal spraying campaign with DDT was inaugurated in 1947 and during the next 3 years more than 5 million persons were protected by this means. The results were spectacular, the case incidence from malaria falling from several hundred thousands annually to approximately 1,000 in 1950. During the next 7 years the total surface sprayed with DDT was reduced from 58 million to 16 million square metres, but this was followed by a recrudescence of malaria. The campaign has since been intensified and the surface sprayed in 1958 was approximately 45 million square metres.

In 1958, 1,208 cases of malaria were reported for the whole of Yugoslavia, of which 10 were attributed to *P. falciparum*, 3 to *P. malariae* and the remaining 1,195 to *P. vivax*, three-quarters of which were relapses.

In 1959 an agreement was signed with WHO in which the principle of total malaria eradication throughout the country was accepted. *G. Covell*

DOUCET, J., ADAM, J. P. & BINSON, G. Les Culicidae de la Côte d'Ivoire. [**Mosquitoes of the Ivory Coast**] *Ann. Parasit. Humaine et Comparée*. 1960, Apr.–June, v. 35, No. 3, 391–408, 2 folding maps. [15 refs.]

The Ivory Coast contains two main vegetational areas, dense forest in the south along the coast, which extends inland in the west and also in the east, and savannah to the north. Both types of vegetational area are described, and the species of mosquito found in towns or forest on the coast, in towns or forest further from the coast, and in the savannah, are listed separately. A map shows the distribution of 28 species and varieties of *Anopheles*, and another map shows the vegetation and rainfall, in the area.

Anopheles gambiae and *A. funestus* are recorded from all the vegetational areas listed, including Mount Orumboboka (600 m.), but *A. gambiae* is the only anopheline given in the list of 12 mosquitoes found throughout the region and is recorded as the most important vector of malaria. *A. gambiae melas* is also found along the coast.

Aedes aegypti is recorded as present throughout the area and *Aedes africanus* is recorded from the forest and is listed as an urban mosquito on the coast. Records of 96 other species of culicine mosquito are also given.

B. R. Laurence

GOMA, L. K. H. **Experimental Breeding of *Anopheles gambiae* Giles in Papyrus Swamps.** [Correspondence.] *Nature*. 1960, Sept. 24, v. 187, 1137–8. [10 refs.]

In Uganda, *Anopheles gambiae* does not breed in the interior of papyrus swamps, in their natural undisturbed state; but breeding may occur at the

periphery, outside the papyrus zone, especially in hoof prints, cattle drinking places and open pools [this *Bulletin*, 1941, v. 38, 233].

The breeding sites of mosquitoes may represent nothing more than the oviposition choice of the females; or oviposition can be relatively unselective, but the larvae may thrive more in certain sites. To test the latter possibility, various sites in a papyrus swamp were chosen and artificially "infested" with *A. gambiae* larvae, which were retained in cages of nylon gauze or iron drums. The adults emerging from them were collected at intervals. Two sites were outside the papyrus zone, one just inside, and 4 were well inside it, in considerable shade.

The results showed a rather low proportion of adult emergences in most cases and some indications of a lengthening of the larval period.

[The results are rather difficult to assess since mixed larval stages were used at 4 sites, VIth stage only at 2 sites and Ist stage at one. No data for emergence at optimum sites are given for comparison.] *J. R. Busvine*

VARGAS, L. Lista de *Anopheles* de las Américas y su identificación por caracteres masculinos (Diptera: Culicidae). [**List of American *Anopheles* and their Identification by Male Characteristics**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, Dec., v. 19, No. 4, 367–86. English summary (6 lines).

WORLD HEALTH ORGANIZATION, DIVISION OF MALARIA ERADICATION & LISTER INSTITUTE OF PREVENTIVE MEDICINE. **A Study of the Blood-Feeding Patterns of *Anopheles* Mosquitos through Precipitin Tests. Results of Collaborative Work for the Period 1955–59 and their Application to Malaria Eradication Programmes.** *Bull. World Health Organization.* 1960, v. 22, No. 6, 685–720, 2 figs. [Numerous refs.]

The opening sections of this report trace the history of efforts to identify the host of blood-sucking insects and sums succinctly the findings by various authors before the present survey for the *Anopheles maculipennis* complex, *A. minimus, A. maculatus, A. gambiae, A. darlingi, A. culicifacies, A. punctulatus punctulatus* and *A. farauti*. The natural feeding pattern for these important malaria vectors is by no means exclusively on man; degrees of choice between man and various animals (notably cattle) vary, moreover, from place to place for one species depending on circumstances, including sometimes factors not clearly determined. The same variability applies also to other vectors, *A. quadrimaculatus, A. stephensi, A. funestus* and *A. sinensis* being named. In view of this proportionate variability in choices, it is recommended that such terms as "anthropophilic" and "zoophilic" should not be used for mosquitoes. Recommendation is made for "the host of predilection" where a preferred host is established, and for expressing the proportion in a sample of *Anopheles* fed on man out of all positive tests obtained (as tested by precipitin test) as the "human blood ratio" and not as the "anthropophilic index".

In discussing the evaluation of the precipitin test as a means of describing the feeding habits of a mosquito population, emphasis is made on the need for collecting gorged mosquitoes resting outdoors as well as indoors. There is

scope for improving ways of catching outdoor specimens. Host selection by malaria vectors requires to be interpreted in conjunction with other mosquito habits, if its epidemiological significance is to be evaluated properly. Here, it is necessary to attempt the now well-known mathematical measure of the risk of malaria transmission propounded by MACDONALD [this *Bulletin*, 1958 v. 55, 229]. This is briefly set out, with comment that if the density of a species is extremely high there may be, as for *A. culicifacies* in Madras and Ceylon or *A. maculipennis messeae* in Europe, explosive malaria outbreaks even although the other very relevant factor, man-biting habit, is of low degree.

The World Health Organization, in conjunction with Mr. B. WEITZ at the Lister Institute of Preventive Medicine, Elstree, England, instituted the present host survey as crucial to better understanding of disappointments and failures in malaria control and eradication. The service provided both for detecting human blood meals only, and for differentiation also between non-human hosts. The latter is seen now to be important information, in view of the many negatives resulting from the restricted test, and the recent evidence of *Anopheles* transmitting mammalian but non-human malaria (monkeys, water buffalo, fruit-bats, porcupines, squirrels, antelope, etc., besides birds). Species involved include *A. dureni, A. smithi rageaui, A. machardyi, A. vanthieli,* possibly *A. letifer* and *A. coustani.* Also, secondary vectors of human malaria can no longer be dismissed as of minor significance and must be studied carefully.

The procedure developed by Mr. Weitz is briefly described (together with a diagram). The agglutination-inhibition test was not generally used for the malaria vector surveys here reported upon, the precipitin test alone sufficing to differentiate man, bovids, horse and donkey, sheep and goat, and pig. The standard punch card used for recording results is illustrated. Except in the last 2 years, some bias in results due to selection of conveniently productive catching places is conceded. Also, details of spraying history are now collated, and lesser vectors investigated.

In the 5 years, 56,377 gut smears were tested by precipitin test with positive results from 93·9%. The results are tabulated in some detail for over 50 species of *Anopheles.* Human blood ratios of over 75% were obtained for *A. barbirostris, A. gambiae, A. funestus, A. l. leucosphyrus, A. hancocki* (a notable observation), *A. moucheti, A. nili, A. sundaicus* and *A. wellcomei.* Less than 5% is recorded for 20 other species. The most preferred host seems to be bovids, with horse and donkey close seconds, sheep and goat third, and to lesser extents dog or cat, pig and bird. Some camel and monkey bloods were identified. Multiple feeds were about 0·4 to 0·5%.

The text briefly discusses the results for various species drawing attention to findings anomalous in terms of malaria transmission and suggesting, where feasible, possible explanations. The contribution of blood-meal analysis to interpretation of mosquito movements after contact with indoor residual insecticides is considered. Faulty techniques in collecting samples sometimes make conclusion impossible, but there is evidence of changed resting habit with DDT for *A. sacharovi* in Greece, but not for *A. gambiae* in Africa exposed to dieldrin in huts. The main table of data is supplemented by 14 other tables, mainly summing facts for particular species, one for 18 species including statement of vectorial status.

The paper concludes with an appeal to individual workers who have used the service to render due report on the results they obtained, and with special

regard to all local conditions bearing on this type of fact and on how the service may have assisted in the practical policy of control procedures.

D. S. Bertram

AL-DABAGH, M. A. **Mechanisms of Death and Tissue Injury in Malaria. I. The Malarial Pigment.** *J. Facul. Med., Baghdad.* 1960, Jan., v. 2 (n.s.), No. 1, 23–34, 2 figs. on pl. [47 refs.]

In his first paper on the factors which determine the lethal outcome and tissue injury in malaria, the author discusses the role of malarial pigment. After considering the origin and nature of haematin, its occurrence in the parasite and distribution in the host, the author concludes that, since the pigment is released into the blood in insoluble form, it does not play an important part in tissue injury or in the causation of the host's death. It is deposited in cells of the reticulo-endothelial (RE) system in inactive form, without producing any irritative or pathological effect on them, except hypertrophy. The latter is thought to be even beneficial, by promoting more efficient phagocytosis. However, the resistance of the host may be weakened by widespread mechanical blocking of RE cells, while deposition of pigment in the capillaries of vital organs (brain, heart, kidneys) causes degenerative and necrotic changes in them.

[See also this *Bulletin*, 1956, v. 53, 1313, 1314.] *C. A. Hoare*

GRANT, D. B., PERINPANAYAGAM, M. S., SHUTE, P. G. & ZEITLIN, R. A. **A Case of Malignant Tertian (*Plasmodium falciparum*) Malaria after Blood-Transfusion.** *Lancet.* 1960, Aug. 27, 469–70. [13 refs.]

The accidental transmission of malaria by transfusion of fresh blood has been recognized since 1911. HUTTON and SHUTE [this *Bulletin*, 1940, v. 37, 456] found that storage of blood at low temperatures (4–6°C., *i.e.* 39–42°F.) for weeks failed to destroy the malarial parasite. Most reported cases have been due to *Plasmodium malariae* and *P. vivax*, but a few due to *P. falciparum* have been recorded.

This is the first case of *P. falciparum* malaria after blood transfusion to be described in England. A woman, aged 41, was admitted in August 1959 with anaemia, oedema and steatorrhoea. She was transfused with two pints of stored blood, one of which was from a Nigerian donor. Laparotomy was performed the next day. She received a third pint of stored blood during operation. On the 16th postoperative day she had a mild rigor with a temperature of 101°F.: later after a second rigor, her spleen became palpable.

Large numbers of ring forms were found in thin films and two gametocytes of *P. falciparum* in a thick blood film taken 24 hours later. On standard chloroquine she made a complete recovery.

The patient had been transfused with three pints of stored blood drawn from different donors. Two had lived in England all their lives. The third, a 19-year-old Nigerian, had arrived in England from Lagos in June 1959. His blood was drawn on August 6th and stored for 14 days at a temperature of 4–6°C. before use. He denied any history of malaria, and examination of a number of thick and thin films by two microscopists for 3 hours failed to reveal any parasites.

A further series of blood films was made 10 days later. After a long search one female gametocyte of *Plasmodium falciparum* was found in a thick film and later two merozoites also, and during a further search a second species, *P. malariae*, was revealed.

The opportunity was taken to confirm the action of a single dose of chloroquine phosphate, 600 mgm. (base), to render the peripheral blood of malaria carriers free of parasites within a few hours. So 10 ml. of venous blood from the Nigerian donor was injected intramuscularly into a volunteer and, immediately after, the donor was given 600 mgm. (base) of chloroquine phosphate. 3½ hours later a further 10 ml. of blood was injected into a second volunteer. *P. falciparum* parasites were found in thick blood films taken from the first volunteer after 9 days, but no parasites have been found in the second, despite daily examinations.

All donors who have stayed in malarious areas for even short periods are potential carriers and their blood should be used only for plasma or serum extraction.

Chloroquine renders the peripheral blood of chronic carriers free of asexual parasites within a few hours.

[Those interested in this important question are referred to a letter by HARRISON in the *Lancet*, 1960, Sept. 3, 547. For what happened in 1917, see also this *Bulletin*, 1960, v. 57, 671, 781.] *Philip Manson-Bahr*

SÉNÉCAL, J., LARIVIÈRE, M., COUTURIER, P. & PANIS, J. Paludisme et néphropathie. [**Malaria and Renal Disease**] *Bull. Soc. Méd. Afrique Noire Langue Française*. Dakar. 1959, v. 4, No. 4, 406–11. [19 refs.]

In a series of 9,440 patients seen in hospital in Dakar over a 5-year period the authors have noted the occurrence of renal disease (nephritis or nephrosis) and malarial infection. They recognize the criticisms which may be levelled at attempts to demonstrate the association of two conditions in hospital patients. However, using the χ^2 test they demonstrate the association of malaria and renal disease, and then the particular association of *Plasmodium malariae* infection with nephropathy. A further report is to be made dealing with clinical and therapeutic aspects of these cases, but they comment on the difficulty in eradicating malarial parasites from the blood of those suffering from renal disease.

[See also this *Bulletin*, 1960, v. 57, 1015, 1016.] *S. Bell*

GROUNDS, J. G. **Single Dose Treatment of Malaria with Amodiaquin, Chloroquine and Mepacrine in a Semi-Immune Population.** *East African Med. J.* 1960, July, v. 37, No. 7, 496–500. [10 refs.]

150 Africans proved by blood examination to be suffering from malaria (143 *Plasmodium falciparum*, 3 *P. vivax*, 3 *P. malariae* and 1 *P. malariae* plus *P. falciparum*) were divided into 3 groups and given single-dose treatment in hospital with either amodiaquine (0·6 gm. base), chloroquine (0·6 gm. base) or mepacrine hydrochloride (0·8 gm.). Half adult doses were used for children 10 years and under and quarter doses for those of 4 years and under.

The mean duration of pyrexia from time of admission was 30·5 hours for the amodiaquine group, 56 hours for the chloroquine group and 74 hours for the mepacrine group. Parasite clearance followed a similar pattern. It was concluded that both amodiaquine and chloroquine are excellent single-dose schizontocides while mepacrine is less effective for this type of treatment. Although in this trial amodiaquine appeared more rapid in action than chloroquine, the latter is to be preferred for use in underdeveloped countries on account of its lower cost (38 cents per adult patient compared with 60 cents for amodiaquine). *G. Covell*

HITCHINGS, G. H. **Part II. Pyrimethamine. The Use of an Antimetabolite in the Chemotherapy of Malaria and other Infections.** *Clin. Pharmacol. & Therap.* St. Louis. 1960, Sept.–Oct., v. 1, No. 5, 570–89, 3 figs. [160 refs.]

A review.

NEGULICI, Eugenia, CONSTANTINESCO, Piereta, TERITEANU, Elena, CORTEZ, P., CRISTESCO, Aurelia & SĂNDESCO, Ionela. L'action sporontocide et clino-prophylactique de la pyriméthamine simple ou associée à la chloroquine. [**The Sporontocidal and Clinoprophylactic Action of Pyrimethamine, alone or in association with Chloroquine**] *Arch. Roumaines Path. Expér. et Microbiol.* 1960, June, v. 19, No. 2, 303–16. [11 refs.]

The subjects of the experiments here described were patients suffering from neurosyphilis awaiting treatment with malaria therapy.

I. Experiments with *Plasmodium vivax* infections

(a) *Sporontocidal and schizontocidal effect*

A single dose of pyrimethamine alone or associated with chloroquine was administered to 11 patients at intervals from 7 to 16 days after the first detection of gametocytes in the peripheral blood. 2 patients received a single dose of 25 and 50 mgm. of pyrimethamine respectively and 9 others a single combined dose of 25 mgm. of pyrimethamine and 300 or 600 mgm. of chloroquine.

Batches of *Anopheles labranchiae atroparvus* fed on the patients before drug administration became infected in 20 to 100% of cases. Those fed from 4 hours to 7 days after treatment failed to become infected. 3 patients experienced long-term relapses 220, 211 and 272 days respectively after the initial treatment and 91, 43 and 85 days respectively after a second single dose, indicating that pyrimethamine has no action on the late exo-erythrocytic forms of the parasite. A second long-term relapse 46 days after a third single dose lent further support to this hypothesis.

The schizontocidal effect was relatively slow when pyrimethamine was given alone, but was markedly accelerated when chloroquine was given in association with it.

(b) *Prophylactic effect*

Single doses of 25 or 50 mgm. of pyrimethamine were administered to 6 patients who were subsequently bitten by infected mosquitoes on the same day

or at different intervals thereafter over a period of several weeks. Fever and parasitaemia were noted in 3 of these after 63, 50 and 43 days of protection respectively and in the 3 others after 255, 282 and 255 days respectively. The latter 3 patients had received schizonto-gametocide treatment (chloroquine plus plasmoquine) 89, 50 and 40 days respectively after the original dose of pyrimethamine. It was thus demostrated that pyrimethamine has no action on the sporozoites of *P. vivax* or on the pre-erythrocytic tissue forms, and that the prophylactic action of the drug on the erythrocytic forms lasted for periods varying from 40 to 89 days.

II. Experiments with *P. falciparum* infections

(a) *Sporontocidal and schizontocidal effect*

A single dose of pyrimethamine alone or in association with chloroquine was administered to 15 patients infected with *P. falciparum* in whose blood gametocytes had been detected. None of the batches of *A. l. atroparvus* subsequently fed on these patients became infected. No relapses were observed in any of these 15 patients after a period of observation varying from 30 to 329 days.

(b) *Prophylactic effect*

A single dose of 50 mgm. of pyrimethamine was given to each of 3 patients who were subsequently exposed to the bites of infected batches of *A. l. atroparvus*. None of these patients showed any evidence of malarial infection over periods of 92, 284 and 141 days of observation. *G. Covell*

PRINGLE, G., DRAPER, C. C. & CLYDE, D. F. **A New Approach to the Measurement of Residual Transmission in a Malaria Control Scheme in East Africa.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, Sept., v. 54, No. 5, 434–8. [14 refs.]

In the Taveta-Pare Malaria Scheme some 50,000 persons living in a malarious area on the Kenya-Tanganyika border were protected by residual spraying of huts with dieldrin, starting in 1955 [this *Bulletin*, 1957, v. 54, 917; 1959, v. 56, 917; 1960, v. 57, 448]. In the fourth year of protection, despite the absence of infected anophelines and a very low infant parasite rate, infections with *Plasmodium falciparum* were still fairly common in children and adolescents.

A group of 262 persons, representing about half the population of a hamlet in South Pare, were treated with chloroquine or pyrimethamine or a combination of the 2 drugs, to clear them of infections with *P. falciparum*. When examined 4 months later all those found infected on the first examination were free from parasites, while a number who were uninfected earlier now had detectable parasitaemia. The results were interpreted as evidence of recent transmission, and it was calculated that from 4 to 8% of older children and adolescents had acquired fresh infections during a period of little over 4 months. If such a rate of transmission can occur, even temporarily, in a district where the infant parasite rate over the previous year had been of the order of only 1%, doubt must arise as to the sensitivity of this index as a measure of transmission.

The experiment suggests that older children and adolescents are more likely

than infants to be successfully inoculated with malaria, and hence to demonstrate the existence of low levels of transmission. The authors contend that their method of assessing transmission by clearing infection from a selected group which then serves as an indicator merits further trial, and may prove suitable for routine use in measuring residual transmission during the intermediate stages of malaria eradication schemes. *G. Covell*

SOPER, F. L. **The Epidemiology of a Disappearing Disease: Malaria.** *Amer. J. Trop. Med. & Hyg.* 1960, July, v. 9, No. 4, 357–66.

This paper is the substance of an address delivered by the author before the American Society of Tropical Medicine and Hygiene on October 28, 1959. Dr. Soper had recently completed a tour in Asia to study at first hand certain eradication programmes, which, after early dramatic reductions in malaria incidence, had failed to effect eradication on the anticipated schedule. The countries visited were Taiwan, the Philippines, Ceylon, Mysore State (India) and Thailand.

No serious technical difficulties were encountered in any of the areas visited; *Anopheles* resistance to DDT was not a problem, nor was extra-domiciliary transmission of malaria proven.

In the Philippines most of the recrudescence of transmission found was attributed to the re-introduction of infection from sprayed areas where transmission had never been completely interrupted. In Ceylon, where the spraying programme was reorganized in 1958, the success of the campaign will depend on the seeking out and spraying of all human habitations rather than on attempting to locate every infected person and treating him and his contacts. In Taiwan it has transpired that some of the mountainous areas with scattered populations had been poorly sprayed and some missed entirely. It is now expected that after reorganization this country will become the first in Asia to be able to declare the eradication of malaria. In Thailand discontinuance of spraying has been possible in certain areas without the recurrence of malaria transmission. There has not yet, however, been complete coverage throughout the country and the programme is not sufficiently advanced to permit an appraisal of the problems to be encountered in the terminal stages of the campaign. In India it was originally intended to protect 225 million persons living in highly malarious areas. It is now recognized that measures must be extended to protect another 170 million people living in areas where the disease is a relatively minor problem. The programme now being developed aims at the spraying of the homes of 390 million people during 1960. The very size of the project and the necessity of co-ordinating the programmes of State services and of covering rural, nomadic and itinerant populations seem to be the chief obstacles to success in India.

As regards the concept of world-wide malaria eradication, Dr. Soper notes that this implies nothing less than the disappearance of all forms of human plasmodia, not only from the Americas, from Asia and the Pacific, but also from the U.S.S.R., China, Outer Mongolia, North Vietnam, East Germany and Africa. In general, the communist countries, with governmental interest in the productivity of their industries and relatively tight control over their peoples, may be expected to eradicate malaria as fast as, or even faster than, the rest of

the world. In the U.S.S.R. a deliberate attempt to eradicate malaria dates from 1952, following an observed reduction in incidence of almost 80% in 2 years. It is now claimed that the country is on the threshold of complete eradication of this infection. In China, information as to antimalaria activities is incomplete, but no technical difficulties are anticipated. In the south-west, where malaria is most prevalent, there are formidable transportation difficulties, but roads are not entirely impassable and the local mosquito is notoriously susceptible to DDT.

In Africa, eradication has been planned and is being attempted in a number of the more temperate countries, but there has been some reluctance to undertake eradication programmes south of the Sahara and north of Southern Rhodesia. The low economic level, high rate of transmission, shortage of trained personnel and difficulties of communication are unfavourable factors. The author notes that the establishment of national independent governments throughout Africa may well create a demand for international participation in eradication programmes in Africa much earlier than would have been the case had previous political conditions been maintained.

In the Americas, practically all of the malarious countries are engaged in the eradication effort. Difficulties with anopheline resistance to insecticides have been encountered, particularly in El Salvador and Nicaragua, while extradomiciliary transmission seems to be a factor delaying eradication in certain areas of Venezuela, Costa Rica and elsewhere. In the Amazon Valley, where habitations are widely scattered and difficult of access, an attempt is being made to solve the problem with medicated table salt.

Dr. Soper draws a parallel between the pattern of malaria eradication in many countries today and that observed during the Yellow Fever Eradication Programme in South America 30 years ago. He believes that just as improvement in administration and methods for rendering yellow fever and its vector visible resulted in a definite change for the better at that time, so we may anticipate that the next few years will see tremendous advances in the intensification and improvement of efforts for the eradication of malaria throughout the world. As the global eradication programme advances, a residuum of malaria will inevitably be found in certain countries with low economic resources and inadequate administrative organizations, to whom the cost and difficulties of eradication may seem prohibitive. It is inevitable that more assistance will flow, if for no other reason than as a matter of self-defence, from the more fortunate nations. *G. Covell*

MÁRQUEZ ESCOBEDO, M. B. La erradicación del paludismo en Mexico. [**Eradication of Malaria in Mexico**] *CNEP Bol.* Mexico. 1960, Jan–Mar., v. 4, No. 1, 3–11, 8 graphs.

This paper recapitulates the history, organization, epidemiology and other aspects of the malaria campaign in Mexico with which readers of this *Bulletin* will be familiar [this *Bulletin*, 1960, v. 57, 451, 883].

It is illustrated with maps, tables and figures in which various features are recorded up to 1959 [*loc cit.*]. One table gives the monthly results of blood examinations up to December 1959, by which time, it is noted, the percentage of positives had fallen to 0·34. *H. J. O'D. Burke-Gaffney*

GÓMEZ MENDOZA, I. La toma de muestras de sangre a enfermos febriles, el indice parasitario en escolares y el indice parasitario en infantes, como medios para valorar la campaña de erradicación del paludismo en México. **[Blood Films from Persons with Fever, Parasite Index in Schoolchildren and Parasite Index in Infants as Methods of Evaluating the Malaria Campaign in Mexico]** *CNEP Bol.* Mexico. 1960, Jan.–Mar., v. 4, No. 1, 12–14. English summary.

Before the malaria eradication campaign began in Mexico in 1956, parasite and spleen rates in infants and children were the malariometric indices used in Mexico. Thereafter examination of blood from persons with fever was accepted as a better method of evaluating the eradication campaign.

In 1959 a considerable proportion of blood films from febrile persons proved negative and it was decided to study the infant and schoolchildren indices in these areas and to compare them with pre-campaign figures in order to see if these indices were, after all, a better measure of the success of the campaign. A survey was made in urban, suburban and rural areas in 83 localities in the 14 zones. Blood films were taken from infants under 1 year old, schoolchildren aged 5–14 years and from persons with fever, either notified or discovered by survey. Among more than 500,000 people films were taken from more than 42,000 children. The findings are tabulated for all the 83 localities. Positive blood films were found in children in only 2 localities, and in one of these the infection had been imported. Films were taken from more than 7,000 infants and all were negative.

Between January and September 1959, nearly 20,000 blood films were taken from febrile persons in the 83 localities: 65 of these were positive and they came from 25 localities, which included the only one (Arroyo Grande) which had shown autochthonous infection in schoolchildren.

H. J. O'D. Burke-Gaffney

CABRERA PALMA, N. de J. Adiestramiento de campo sobre disciplinas de epidemiología en la "CNEP". **[Field Training in Epidemiological Techniques in the Mexican National Commission for the Eradication of Malaria]** *CNEP Bol.* Mexico. 1960, Jan.–Mar., v. 4, No. 1, 15–40, 6 figs. [53 refs.] English summary.

This paper describes in detail, with maps, figures and tables, the theory and practice of instruction carried out by the Training Branch of the Mexican National Commission for the Eradication of Malaria. The objectives, exercises and equipment are discussed and the curricula for technical and auxiliary staff described.

There is an advanced course in malariology for physicians and engineers, beginning with a theoretical and practical part held in Mexico City and a second part devoted to field training held in the special training area in the state of Veracruz. This is described fully.

The principal epidemiological activities of the 3 stages in malaria eradication are stressed. Finally, the paper gives details of the number of senior persons trained and their origins.

H. J. O'D Burke-Gaffney

EHRLICH, S. & SPIELBERG, D. **Alteration of the Environment of *Anopheles* Larvae by Nutria in the Naaman Swamps, Acre District, Israel.** *Amer. J. Trop. Med. & Hyg.* 1960, May, v. 9, No. 3, 265–8, 5 figs.

The swamps and fish ponds along the Naaman River, near Acre in Israel, are breeding places of *Anopheles sacharovi* and *A. hyrcanus*, and the area is malarious. Drainage of the swamps has been poor owing to the growth of aquatic vegetation in concrete and earth drainage ditches, and the drainage ditches themselves have become mosquito breeding places. Removal of the vegetation by hand has proved inefficient, but the introduction of nutria [presumably *Myocastor coypus*] has kept down the growth of aquatic vegetation. The drainage system has remained open for 3 years and it has also proved possible, in the absence of vegetational cover, to use insecticide control measures more efficiently. *B. R. Laurence*

HOCKING, K. S., ARMSTRONG, J. A. & DOWNING, F. S. **Gamma-BHC/Cereclor —a New, Long-Acting Lindane Formulation for Malaria Control.** *Bull. World Health Organization.* 1960, v. 22, No. 6, 757–65. [11 refs.]

For *Anopheles gambiae* in Africa, malaria control requires that gamma BHC persist on any surface to give 50–60% mortality for at least 6 months [this *Bulletin*, 1954, v. 51, 770]. The residual effectiveness of gamma BHC, highly toxic to anophelines, has however proved variable, from 1–2 months on plywood or thatch to 12 months on mud [*ibid.*, 1958, v. 55, 251], the latter type of surface retaining the longer insecticidal action by initial sorption of the insecticide and its subsequent slow vaporization. Combination of gamma BHC with resins offered prospects of improving the persistence of BHC and results are given of a field experiment with such a compound. This has run for a year, and is still in progress, at Magugu village, Tanganyika. Gamma BHC, compounded as a dispersible powder with a proprietary resin, Cereclor, was sprayed at 0·5 gm. gamma BHC per square metre in huts on interior walls made of one of three kinds of mud or of plywood, with roofs of sisal pole and grass thatch. The huts were built to village type but variously modified for experimental purposes. The single window carried a conventional lobster-pot exit-trap. Other huts were sprayed with gamma BHC only and there was an unsprayed control hut. Window-trap catches and bioassay of surfaces were the methods of comparison, *A. gambiae* being used for the WHO bioassay wall tests and some slight modification of this for testing roof thatch. Some huts were first sprayed in April, others in November (1958). In the dry season (July–December) mosquitoes were too few for record. (The control, incidentally, attracted more *A. gambiae* than the treated huts but this is interpreted as due to the control being occupied for 2 years and the sprayed huts being new.) Except for one hut which was damaged, both gamma BHC alone and gamma BHC/Cereclor gave mortality of about 50% for 6 months on plywood and on mud walls (1 highly absorptive type, 2 of low sorptive nature).

From deaths or 24-hour mortality data in window-trap catches and floor collections, gamma BHC/Cereclor was still effective (70% mortality) after 12 months on the sorptive mud and on a less sorptive mud. Gamma BHC was slightly less effective by about this time. (Plywood surface experiments had

not been a year in progress.) Bioassay work involving both Petri dishes on walls and funnels closed with netting (necessary for tests on thatch and sisal poles) showed the former to give much greater kills (100% compared to 5% 24-hour mortality after half an hour contact) and checks of funnel with and without netting showed the netting to be responsible for the lesser kill. Latterly, funnels were used for wall, as well as for thatch and pole, assays. A much sharper difference is found by these bioassays, gamma BHC/Cereclor giving high mortalities on mud walls, thatch and poles but gamma BHC only so on the mud walls at 6 months. (Plywood by bioassay was the least successful of any surface with the resin preparation.) Other surfaces (*e.g.* doors, creosoted before spraying, and the hardboard floors) still killed some *A. gambiae* 6 months after gamma BHC spraying, but only BHC/Cereclor gave high mortalities after 12 months.

In discussion, special note is made of the long residual effect of gamma BHC/Cereclor on thatch and poling as favourable for effective malaria control where thatching is a characteristic hut material. Bioassay (although to a less extent mortalities in trap and floor catches) also indicated that gamma BHC/Cereclor persists much better than gamma BHC alone both on highly sorptive and on low sorptive mud walls. It is concluded that gamma BHC/Cereclor offers prospects of long residual action due to vaporization after initial sorption into mud with also prolonged contact action on non-sorptive surfaces, a combination defined (by WHO) as desirable in an insecticide for malaria control in the usual patterns of houses with mud walls and thatch or other non-sorptive roofing. Detailed tables provide the numerical detail of the hut catches and their mortalities, and of the bioassay tests. *D. S. Bertram*

PERRY, A. S. **Investigations on the Mechanism of DDT Resistance in Certain Anopheline Mosquitos.** *Bull. World Health Organization.* 1960, v. 22, No. 6, 743–56, 7 figs.

The work reported was done under the auspices of the World Health Organization at laboratories in Greece, Italy and Turkey with a view to determining if resistance to DDT in anopheline mosquitoes was of the same nature as in house-flies and, notably, due to conversion of DDT to DDE. The more elaborate biochemical and other equipment was taken to the laboratories visited. Details are given of the techniques used for preparing surfaces of residual deposits, exposure chambers, etc., (the standard WHO kit was not used) and of biochemical analyses. Evaluation takes account of the 24-hour mortalities after 30 minutes on various surface deposits of insecticide and also actual amounts of insecticide picked up by dead and surviving insects, with the use of spectrophotometry for detection of DDT and DDE. Insect material was as follows: *Anopheles sacharovi* from Skala in Greece, formerly reported highly DDT resistant [this *Bulletin*, 1960, v. 57, 103] and from Adana in Turkey, more recently reported DDT resistant; some field material of *A. labranchiae atroparvus, A. labranchiae, A. superpictus, A. claviger* and laboratory colonies of *A. stephensi* and *A. l. atroparvus*, either susceptible or highly DDT resistant by laboratory selection over 21–39 generations; also *Culex pipiens* var. *molestus* as an originally resistant stock but unselected for DDT resistance over 12 years of culture.

In a comparison of the Busvine-Nash method, the WHO standard kit and the present method of exposure, mortalities at 24 hours were, respectively, 45%, 85% and 72–89%. It is shown that actual pick-up per mosquito was, respectively, 0·039 μgm., 0·06 μgm. and 0·048–0·062 μgm., giving a satisfactory agreement between the three methods in terms of mortalities in relation to dose of DDT picked up.

The results are presented in several graphs and tables.

In discussion it is noted that the formerly DDT resistant Skala mosquitoes of Greece are now only slightly resistant and much more susceptible than the recently reported DDT resistant Turkish Adana material, a convenient field comparison. Both mortality-dosage curves and lethal pick-up showed this (0·040 μgm. DDT per mosquito at Skala, but 0·42 μgm. at Adana). The explanation may rest in the discontinuance of DDT spraying in Greece for some years back. This slightly resistant Greece material yielded, however, more DDE than DDT in extracted mosquito samples (there is some uncertainty if the DDE was quite typical biochemically) and it is tentatively questioned whether this degradation is, in fact, a protective mechanism in this *A. sacharovi* of Greece. Reasons are offered suggesting why the slight resistance found may suffice to cause failure of control. The DDT resistant *A. sacharovi* of Turkey, however, showed, as for house-flies, good positive correlation of low mortalities with high DDE content indicating degradation of DDT to DDE to be the protective mechanism involved. Some resistant *A. m. melanoon* were also found at Adana in Turkey. None of the field material of Italy (*A. l. atroparvus, A. maculipennis typicus, A. labranchiae, A. sacharovi, A. claviger, A. superpictus*) were found resistant. From the various laboratory strains examined there is indication of need to study more carefully the part played by rates of pick-up and absorption of DDT as well as detoxification of DDT to DDE in the survival of resistant insects. *D. S. Bertram*

MUIRHEAD-THOMSON, R. C. **The Significance of Irritability, Behaviouristic Avoidance and Allied Phenomena in Malaria Eradication.** *Bull. World Health Organization.* 1960, v. 22, No. 6, 721–34. [40 refs.]

DDT-treated surfaces have long been known to irritate mosquitoes which land on them. Some may then fly out of treated premises. Some of them may die, others may not; the latter may, however, behave abnormally. This paper attempts an appraisal of the behaviour of mosquitoes after non-lethal contact with insecticide (notably DDT). The author first of all suggests that "*behaviouristic avoidance*" might be used to include both *natural avoidance* ("protective avoidance"), which is an intrinsic reaction in mosquitoes which leads to their being irritated by and leaving a treated surface on their initial contact and without acquiring a lethal dose, and "*behaviouristic resistance*" which is this initial natural avoidance intensified in a species by long experience (maybe years) of contact with insecticides. The former term is often nowadays an impracticable concept owing to lack of basic facts on initial irritability in species and also to the widespread use of insecticides, which may already have enhanced a natural tendency into a reaction classifiable as induced behaviouristic resistance. It is then emphasized that mosquito irritability to DDT, with flight to light, was quite frequently noted and well reported 10–15

years ago. Progressive investigations over the years are then traced up to the present time. These cover the use of window-traps in treated natural and artificial huts, time-exposure experiments, work on excitation. Only DDT is likely to lead to " behaviouristic avoidance " [*i.e.* in the sense of induced " behaviouristic resistance "].

Most earlier records of irritability to DDT are here grouped as natural avoidance. The generally accepted instance of behaviouristic resistance—in *A. albimanus*—is, however, not acceptable as such to the present author. Moreover, he questions that behavioural changes are necessarily conducive to ill-effects on malaria control. Low man-biting rates (*A. albimanus*), prevention of selection for extreme physiological DDT resistance (*A. sacharovi*), are two favourable outcomes quoted. Mosquito behaviour in relation to contact with insecticides is now deserving intensive study and this paper describes briefly and discusses different laboratory tests recently developed to measure excitation times and various field observations and experiments which have been, and should be, made in investigations of this type of problem. Provided sufficient pre-spraying data exist, or can be obtained, comparison of catches from different resting places (treated and untreated) combined with mortality tests of the catches should indicate existence of " behaviouristic avoidance " following contact with insecticide. Increased outdoor biting (on baitmen) would similarly suggest this phenomenon. Experimental huts and window-traps can give useful data of various kinds if used consistently over long periods. Precipitin tests on collections of outdoor-resting mosquitoes (from natural or artificial sites) may reveal, over time, changes in feeding habit attributable, if other environmental factors are stable, to insecticide action. But methods must be consistent over time, or between control and treated areas in parallel field experiments, as is also emphasized in another previous abstract [see above].

The paper concludes with the author's critical re-appraisal of " behaviouristic resistance " in *A. albimanus*, from which he is unable to accept the case as proved. The available data for " behaviouristic resistance " in *A. punctimacula* in Colombia are also unconvincing to the author. His own data for *A. gambiae* in S. Rhodesia, briefly given, indicate increased exophily and exophagy [? man or animal] after 8 years of BHC spraying. But this is probably a result of selective elimination of an endophilic-endophagic population, since BHC does not induce that irritability which is the basis for the development of " behaviouristic resistance " to DDT.

This paper will have served a useful purpose indeed if its critical outlook leads eventually to less confusion in this field of study and, to quote from it, " produces, ultimately, not different schools of thought, but one school of fact ".

D. S. Bertram

Saccà, G. & Guy, Y. Résistance de comportement au DDT chez *A. labranchiae* au Maroc. [**Behaviouristic Resistance to DDT in** *Anopheles labranchiae* **in Morocco**] *Bull. World Health Organization.* 1960, v. 22, No. 6, 735–41. [13 refs.]

In April 1959, it was observed that in a Moroccan village previously treated with DDT, *Anopheles labranchiae* were few, but restless, on the formerly treated surfaces on which some DDT persisted. On the other hand, large numbers

(200–300 females) rested in a part of a house not previously treated. Large-scale breeding occurred in a nearby marsh. These restless mosquitoes nearly all survived 24 hours of captivity and no physiological resistance was detected by WHO tests of the mosquitoes generally in the area. Laboratory and field observations to measure their irritability to DDT are reported. The former consisted of counts of flights in 15 minutes when mosquitoes were confined with DDT-treated paper. No marked differences were found, however, between *A. labranchiae* from an area sprayed with DDT some years before and from an untreated area, although the data indicate a generally greater irritability than for mosquitoes of this complex tested similarly by others in Greece, Rome and Italy. Detailed consideration of the data suggested to the authors that the test technique must be improved (various environmental factors suspect) until control mosquitoes approached immobility during the exposure period. Developments of this nature are discussed and described and further tests involving in all 700 mosquitoes were made, some being from an untreated area, others from a place treated with DDT 2 years before. Again, no difference in irritability was detected.

In field observations, reported from Braila village which had been sprayed with DDT every spring for the last 7 years, *A. labranchiae* was breeding abundantly. (Domestic stock sleep out-of-doors or in very simple shelters.) In human premises the mosquitoes were found in quite large numbers, and commonly gorged, resting quietly if on untreated walls, in nomad tents or on walls on which DDT has been obscured (as in cooking huts). In previously treated dwellings, mosquitoes were fewer, often gorged, and restless. Some were found on furniture, or crevices of the ground, etc. Mortality after 24 hours' captivity was slight. The authors comment that 4 explanations may be involved: physiological DDT resistance; wearing out with time of the effective DDT deposit on the wall; possibly, also, poor initial deposit; and repulsion (*i.e.* irritability). By bioassay tests on walls, physiological resistance was not apparent. DDT activity (5 months after spraying) was fully satisfactory and this included acceptance of satisfactory spraying in the first instance. It is concluded that the mosquitoes were being irritated on contact with DDT, moving as a result from any DDT-surfaces before taking up a lethal dose, and only resting quietly when ultimately alighting by chance on an untreated surface or a treated one no longer with sufficient deposit to irritate.

The effect of all this on biting habits was examined by precipitin tests (by Mr. Weitz of the Lister Institute, England). Human blood was identified in 48·6% of 109 females from treated houses, in 64% of 75 females in tents, in none of 15 specimens from stables, in 9·4% of 85 females from the cooking huts (unoccupied by night) and in only 1·2% of 162 females taken gorged in uninhabited artificial shelters. It is concluded that some numbers of *A. labranchiae*, after engorgement on persons sleeping in huts treated with DDT, finally settle on the non-irritant, smoke-smeared walls of the nearby cooking huts.

Whether this irritability and repulsion from DDT-surfaces as deduced from the field observations, but unmeasurable so far in the laboratory, affect malaria transmission remains unanswered. Nor is it, the authors conclude, clear if the irritability is an intrinsic reaction or enhanced over time by selective pressure. But a better method for laboratory test of irritability is, it is concluded, necessary for future work.

[The irritability seems, to the abstracter, to be essentially an intrinsic reaction

not associated with any enhancement over time, *i.e.* natural, protective avoidance or behaviouristic avoidance, to use the broader term advocated by MUIRHEAD-THOMSON (see above). With much extensive breeding occurring and, from the precipitin test results, so much feeding going on in untreated places on hosts other than man indoors at night, would it not be expected that resistance, whether physiological or behaviouristic, would be slow to develop, if at all, in the mosquito population? This seems to point to the probability of simple natural avoidance. If such is the case, no difference would be found between mosquitoes from treated and from untreated areas, as indeed the irritability tests in the laboratory revealed. It would, of course, still remain important to analyse the relation of the phenomenon to malaria transmission.]

D. S. Bertram

SACCÀ, G. Resistenza al dieldrin di *A. labranchiae* Fall., in Marocco. [**Resistance to Dieldrin of** *Anopheles labranchiae* **in Morocco**] *Riv. di Parassit.* Rome. 1960, June, v. 21, No. 2, 154–6. English summary (6 lines).

In a previous paper [SACCÀ and GUY, above] the author describes the restlessness of *Anopheles labranchiae* mosquitoes on DDT deposits in some of the Moroccan villages mentioned here. This restlessness was not associated with resistance to DDT; but as a result of it some of the mosquitoes avoided treated surfaces and escaped their lethal effects. It was considered desirable to conduct standard (WHO) tests of the mosquitoes' susceptibility to dieldrin.

The results of 5 groups of tests in different localities gave more or less normal results at the lower concentration levels. Above 0·4% dieldrin, however, there was no increased mortality at 2 or 3 villages. The resulting " plateau " type of regression line was evidence of the presence of about 30% of abnormally resistant individuals in otherwise normal populations. The reason for the presence of such a high proportion of immune individuals is obscure. No dieldrin house-spraying has been done, nor does it seem to have been used in agriculture. Up to 1953, there was some aerial spraying of BHC (against *Culex*); but this was discontinued and it would be surprising if the effects of this would persist so long.

Resistance in *A. labranchiae* has not previously been reported.

J. R. Busvine

SERVICE, M. W. **A Taxonomic Study of** *Anopheles funestus funestus* **Giles (Diptera: Culicidae) from Southern and Northern Nigeria, with Notes on its Varieties and Synonyms.** *Proc. Roy. Entom. Soc. of London.* Ser. B. 1960, July 8, v. 29, Pts. 5/6, 77–84, 8 figs. [18 refs.]

In recent years there have been two malaria control projects in Nigeria depending on spraying by residual insecticides: one at Ilaro, Southern Nigeria [BRUCE-CHWATT *et al.*, this *Bulletin*, 1956, v. 53, 21] and the other in Western Sokoto, Northern Nigeria [*ibid.*, 1958, v. 55, 863]. At Ilaro, in the zone of dense secondary forest of S. Nigeria, *A. funestus funestus* disappeared after a few months' use of BHC; while in the more arid N. Nigeria, the species was

not eradicated by 3 years' regular use of BHC, DDT and dieldrin. As a possible explanation for this difference, it was suggested that two different populations exist, varying in susceptibility to insecticides. If this were so, it might also happen that the two populations might vary in some anatomical characters.

Accordingly, a comparative taxonomic study was made of specimens from the northern and southern regions (those from the latter including some from a laboratory colony). The results of this study showed no consistent difference in anatomical characters of larvae, pupae or adults, except perhaps in the wing scaling. The northern and southern forms could not be regarded as morphologically distinct races. This does not exclude physiological differences, of course. However, although there are measurements of susceptibility levels of the northern forms [*ibid.*, 1957, v. 54, 1052], there are none of southern forms for comparison.

[A simple alternative explanation of the extinction of *funestus* at Ilaro might be that conditions (*e.g.* humidity) might favour the action of the insecticide there.] *J. R. Busvine*

GILLIES, M. T. & SMITH, A. **The Effect of a Residual House-Spraying Campaign in East Africa on Species Balance in the *Anopheles funestus* Group. The Replacement of *A. funestus* Giles by *A. rivulorum* Leeson.** *Bull. Entom. Res.* 1960, July, v. 51, Pt. 2, 243–52, 1 fig.

"In the course of an experiment in malaria control in an inland region of Kenya and Tanganyika, by the use of house spraying with dieldrin, routine catches were maintained of mosquitoes resting in artificial outdoor shelters. During the 18 months of the pre-spraying period, catches in the South Pare district of Tanganyika mainly consisted of the principal vectors, *Anopheles gambiae* Giles and *A. funestus* Giles, together with small numbers of *A. rivulorum* Leeson.

"During the three years following the spraying, *A. funestus* disappeared almost completely from the catches, while *A. rivulorum* showed an increase of about seven times above its former level.

"It is concluded that this change in numbers of *A. rivulorum* was associated with the disappearance of *A. funestus* from breeding sites formerly occupied by both species.

"Precipitin tests indicated that *A. rivulorum* is mainly zoophilous and had not played any part in malaria transmission."

[See this *Bulletin*, 1954, v. 51, 248.]

MATHIS, W., KILPATRICK, J. W. & JOHNSON, H. F. **DDT Resistance in *A. quadrimaculatus*.** *Pub. Health Rep.* Wash. 1960, May, v. 75, No. 5, 387–90.

In this paper the detection of DDT-resistant *Anopheles quadrimaculatus* in Georgia, U.S.A., is described. The resistant mosquitoes originated in a tributary of a 70,000 acre dam, the Clark Hill Reservoir. The reservoir was first

filled to capacity in 1953 and until 1959 *A. quadrimaculatus* was controlled by larvicide treatments of DDT dispersed from aircraft. In June 1959, it became evident from density counts of adult mosquitoes that DDT was failing to produce satisfactory control. Susceptibility tests were then carried out on adult and larval *A. quadrimaculatus* from the reservoir.

At 2·5 p.p.m. DDT (in ethanol solutions) only 49% of the Clark Hill larvae were killed. 0·02 p.p.m. DDT killed all the larvae from the susceptible laboratory strain (Savannah). [These figures indicate a resistance level for the Clark Hill larvae of *at least* × 100.] Negligible kill was obtained when the Clark Hill adults were exposed to papers impregnated with 4% DDT for 4 hours but exposure of the Savannah strain to 2% DDT for 1 hour gave 89% mortality. A similar range of tests performed with dieldrin showed that the Clark Hill mosquitoes were also resistant, though less so, to this insecticide. The authors point out that resistance to dieldrin was unexpected since this compound had never been employed for mosquito control and its agricultural use in the area was limited.

B. C. Fine

HECHT, O., MANCERA, Ofelia & BARRERA, A. **Relation of DDT-Irritation Threshold to Knockdown of Three Species of Anopheline Mosquitoes.** *J. Econom. Entom.* 1960, Aug., v. 53, No. 4, 634–40, 1 fig. & 4 graphs.

By means of an ingenious apparatus, studies have been made on the irritant effect of DDT on *Anopheles albimanus*, *A. aztecus* and *A. quadrimaculatus*. The time to first flight after contact with papers impregnated with a 4% solution of DDT in Risella oil (corresponding to 1·428 gm. of DDT/m.^{2}) and the time of contact with such papers necessary to produce knock-down have been recorded for 100 females of each species both in the unfed state and blood-fed. Specific differences are apparent. *A. albimanus* is the most quickly irritated and also shows the shortest knock-down times. *A. quadrimaculatus* and *A. aztecus* showed considerably longer irritation and knock-down times. The effect of blood feeding was to lengthen these times in *A. albimanus* and *A. quadrimaculatus* though not in *A. aztecus*.

There were large variations in both irritation and knock-down times in individual mosquitoes though no relation was apparent between time to first flight and time to knock-down. In other words, a mosquito very rapidly irritated did not necessarily show a short knock-down time or *vice versa*.

Of interest to users of the Busvine and Nash mosquito susceptibility test kit and the related apparatus adopted as the standard World Health Organization test kit is the fact that some recovery (up to 15%) was recorded among those mosquitoes knocked down. It will be remembered that in both tests the bottom of the exposure tube is untreated. This small survival may lead to a suspicion of resistance and would point to the necessity of completely lining the insides of exposure tubes with the treated surface.

The authors rightly stress the need for a standardized test for assessing irritability of insects by insecticides and for proving suspected cases of behaviouristic changes in insects resulting from the prolonged use of insecticides.

G. Davidson

VARGAS, L., ROMÁN Y CARRILLO, G. & DÍAZ NÁJERA, A. Nuevas técnicas para estudiar la susceptibilidad de artrópodos a insecticidas persistentes. II. Susceptibilidad al DDT y a la dieldrina de *A. pseudopunctipennis pseudopunctipennis* y *A. albimanus* del municipio de Tlalixcoyan, Ver., México. [**New Techniques for Studying Susceptibility of Arthropods to Insecticides. II. Susceptibility to DDT and to Dieldrin of** *Anopheles pseudopunctipennis* **and** *A. albimanus* **in Tlalixcoyan, Mexico**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, Sept., v. 19, No. 3, 271–91, 5 graphs.

The English summary appended to the paper is as follows:—

"The authors tested the susceptibility of *A. albimanus* and *A. pseudopunctipennis pseudopunctipennis* by the method of constant lethal dosage of the insecticide, DDT or dieldrin, recording the number K.D. every 5 minutes till the count or the last one.

"The females were always naturally blood-fed, and were collected in the Municipality of Tlalixcoyan, State of Veracruz, Mexico.

"The more susceptible were *albimanus* to DDT, followed by *pseudopunctipennis* to dieldrin, *pseudopunctipennis* to DDT and *albimanus* to dieldrin.

"The mean times for K.D. were about 26, 33, 36 and 37 minutes respectively and the corresponding limits of tolerance 9·4, 9·8, 2·1 and 3·3 minutes.

"The limit or tolerance over the arithmetic mean is

$$\frac{2\,R\sigma}{\sqrt{N}}$$

where R is the ratio between the true or observed variation of the mean of every sample and the theoretically expected variation of the mean from the samples, starting from one of them, as if all came by chance from the same universe."

[See this *Bulletin*, 1960, v. 57, 883.]

CORRÊA, R. R., ALVES, F. P. & CARVALHO, P. J. Suscetibilidade do *Anopheles darlingi* e do *A. albitarsis albitarsis* ao DDT. [**Susceptibility of** *Anopheles darlingi* **and** *A. albitarsis* **to DDT**] *Arquivos de Hig. e Saúde Pública.* S. Paulo. 1960, Mar., v. 25, No. 83, 25–9, 5 graphs. English summary.

Since a large part of the malaria eradication campaign in the state of São Paulo depends on DDT spraying, it is necessary to be vigilant for possible DDT resistance. Tests have been done, by the WHO method, on females captured in various localities and taken to a suitable place, where they were fed before testing. The results of tests with *Anopheles darlingi* and with *A. albitarsis* gave LC50 between 0·28 and 0·52% DDT and very high (or complete) kills at 2%. These give no hint of incipient resistance despite the continued use of DDT against *A. darlingi* for a decade, in some zones.

Occasional transmission is believed to occur, however, through *A. cruzii* and *A. bellator* biting out of doors; and also *A. darlingi* which sometimes feeds in the open, near rivers, even before dusk. *A. darlingi* breeds particularly heavily in waters infested with aquatic plants of the family Pontedereaceae. Attacks on these plants with hormone weed killers (5% of 2-4 D) are an aid to

malaria eradication. Likewise, bromeliad destruction must be used where *Kerteszia* mosquitoes occur. *J. R. Busvine*

HECHT, O. & CHAPA SALDAÑA, H. Informe de las investigaciones sobre la efectividad del diazinon. [**Studies on the Efficacy of Diazinon**] *CNEP Bol.* Mexico. 1960, Jan.–Mar., v. 4, No. 1, 41–55, 6 graphs. English summary.

This paper, from the Entomological Section of the Mexican National Commission for the Eradication of Malaria, is based on (a) laboratory tests with *Anopheles albimanus*, (b) field studies with *A. pseudopunctipennis*, (c) study of mosquitoes from an experimentally sprayed hut and (d) observations on cross-resistance of diazinon with chlorinated hydrocarbons.

Laboratory tests were carried out with paper sheets impregnated with diazinon in acetone in concentrations of 0·5 gm./square metre and 1·0 gm./square metre. Batches of 10 2-day-old female *A. albimanus* were placed in plastic boxes fixed on the test surfaces and assayed by 24-hour mortality after 30 minutes' exposure and by knock-down every 20 minutes up to a maximum of 180 minutes. With the smaller dose mortality was about 90% between 85 and 110 days, but with the large dose it remained at 100%. In the knock-down tests, a slow decrease in knock-down occurred and at 2 to 3 months no knock-down occurred with the smaller dose, even with maximum exposure; but mortality in these cases remained at 100% up to 6 months after exposure.

In the field tests a hut was sprayed with 25% wettable powder at 2 gm./sq. metre of active substance: the surfaces consisted of adobe walls covered with mud with and without whitewash, wooden rafters, loose adobe blocks and 2 kinds of baked bricks. The *A. pseudopunctipennis* used were collected in the neighbourhood and in unsprayed huts and stables. The results with blocks and bricks gave mortalities of 100% only up to 9 to 30 days. The tests with adobe walls, whether whitewashed or not, were better; mortalities of 100% were obtained up to 50 days, and with longer exposure, mortalities of 45%–100% were obtained up to 88 days. Mortalities of 100% were obtained on wood up to 86 days, but were erratic thereafter. In general the effectiveness of diazinon on the common local mud-covered hut seemed to decrease after 50 days. As, however, *A. pseudopunctipennis* is liable in practice to be exposed to insecticide for several hours, because of its resting habits, the authors conclude from the tests of longer exposure that spraying every 75 days should be sufficient to prevent transmission of malaria.

In other tests, it was concluded that all mosquitoes entering the experimental hut acquire a lethal dose of insecticide by contact, up to 3 months after spraying.

All these results are shown in numerous tables and discussed.

Finally, the authors discuss the question of cross-resistance: this has been noted in the case of house-flies with organic phosphorus compounds and chlorinated hydrocarbons [this *Bulletin*, 1959, v. 56, 371]. "It is not known whether the same can happen with any anopheline species; but in view of the fact that DDT is an effective and at present the only useful insecticide in the spraying operations of the Mexican campaign, the authors are of the opinion that nothing should be undertaken which could lessen the effectiveness of DDT, and phosphorous compounds should not be used in the regions where DDT still is giving the anticipated results." *H. J. O'D. Burke-Gaffney*

HENTSCH, H. F. G. Ist eine erfolgreiche Malariabekämpfung in Indonesien möglich? [**Is Successful Malaria Control Possible in Indonesia?**] *Zent. f. Bakt.* I. Abt. Orig. 1960, v. 179, No. 2, 254–61, 1 fig.

For 10 years from 1948 a great deal of rather unsystematic work against malaria was carried out in Indonesia without much result. In 1958 it was realized that a much more systematic attack would be necessary.

The author summarizes many aspects of a properly conducted antimalarial spray campaign. The plan, in Indonesia, is to divide the country up into 3 areas. Area I is sprayed in the first year; areas I and II in the second year; all areas in the third year; areas II and III in the fourth, and area III in the fifth year. This should theoretically eliminate malaria. However, there are many local difficulties, such as lack of enthusiasm of some workers and unhelpful propaganda reports in the press, leading to unjustified complacency. All efforts and efficiency will be needed to achieve malaria eradication.

Details are given of the composition of spray teams and the equipment and organization of the campaign staff. *J. R. Busvine*

JADIN, J., YOELI, M. & PIERREUX, G. Réapparition du processus d'extraflagellation chez une souche de *Plasmodium berghei* régulièrement entretenue par passage mécanique. [**Reappearance of Exflagellation in a Strain of *Plasmodium berghei* Regularly Maintained by Mechanical Passage**] *Ann. Soc. Belge de Méd. Trop.* 1959, Dec. 31, v. 39, No. 6, 847–50, 3 figs. on pl.

It is well known that continued passage of a parasite by blood inoculation deprives it of its power to produce sexual forms. But working with the *Plasmodium berghei* strain Kasapa 323, the authors succeeded in restoring this feature in the following way. Since 1955 the strain had been maintained by blood passage in mice; in the autumn of 1958, it was passed 9 times through young *Thamnomys surdaster*, and 11 times through young hamsters, in separate lines, in both of which gametocytes made their appearance, especially during the 11th passage, when exflagellation was observed. *Anopheles aztecus* and *A. quadrimaculatus* were allowed to feed on such animals, and oökinetes and later mature oöcysts with sporozoites were found on the midgut of these insects (50% became infected and showed 100–400 oöcysts; sporozoites, however, failed to reach the salivary glands). *P. C. C. Garnham*

SATYA PRAKASH. **Studies on *Plasmodium berghei* Vincke and Lips, 1948. Part XXVI. The Minimum Duration of Patent Primary Parasitaemia in Albino Rats for the Development of Immunity to Resist Reinfection.** *Indian J. Malariology*. 1959, June–Sept., v. 13, Nos. 2/3, 137–44.

103 adult albino rats were inoculated with *Plasmodium berghei* and were treated with sulphadiazine to eradicate the infection on various days (2–15) after parasites had appeared in the blood. Radical cure was established by sacrificing half of the animals as controls, and inoculating the whole blood and organs into rats according to SERGENT's technique [this *Bulletin*, 1955, v. 52,

1170]. The remaining 52 animals were challenged with the homologous strain of parasite, and of those which had suffered from a parasitaemia lasting up to 7 days, all became re-infected, showing that immunity could not develop after only a week's exposure to infection. Between 7 and 10 days, the acquisition of immunity was sufficient to allow 9 out of 19 to resist re-infection, and after the 11th day all the rats failed to become infected. In the partially immunized group (after the fourth day), the prepatent period was prolonged and the length of parasitaemia was short as compared with previous infections.

P. C. C. Garnham

RAFFAELE, G. Commento alle ricerche sulla fase esoeritrocitica dei parassiti malarici. [**Commentary on Researches on the Exo-Erythrocytic Phase of Malaria Parasites**] *Riv. di Malariologia.* 1959, Dec., v. 38, Nos. 4/6, 159–96. [Numerous refs.] English summary.

This is a critical review of previous work on the exo-erythrocytic (EE) cycle of malaria parasites in various vertebrate animals, regarding the course of which opinions are still divided. The author considers at length the EE development in diverse species of *Plasmodium* and arrives at the conclusion that the bird malaria parasites all have a common pattern, *viz.* when inoculated by the vector, the sporozoites are taken up by macrophages, in which they undergo schizogony, giving rise to merozoites of two kinds: small haemotropic forms, which invade erythrocytes in the circulating blood, and large histotropic ones, which repeat the EE development. It is generally thought that *P. elongatum* differs from all other species in the absence of a true EE phase, but the author believes that pre-erythrocytic development takes place in cells of the reticulo-endothelial system. Sporozoites of mammalian plasmodia are not taken up by macrophages, unless they are in unsuitable hosts, but are free to enter the liver cells, in which they develop. In his opinion the course of EE development does not differ significantly among diverse species of *Plasmodium*, while the existing differences do not justify the subdivision of this genus into more genera and subgenera.

C. A. Hoare

HUFF, C. G., PIPKIN, A. C., WEATHERSBY, A. B. & JENSEN, Dinniemaud V. **The Morphology and Behavior of Living Exoerythrocytic Stages of *Plasmodium gallinaceum* and *P. fallax* and their Host Cells.** *J. Biophysic. & Biochem. Cytol.* New York. 1960, Feb., v. 7, No. 1, 93–102, 5 text figs. & 23 figs. on 3 pls. [29 refs.]

The authors made a study of the structure and behaviour of living exo-erythrocytic stages of *Plasmodium gallinaceum* and *P. fallax*, observed in cultures of liver cells from infected chicks, which were isolated by trypsinization and centrifugation, and grown at 37°C. in a medium consisting of chick serum + chick embryo extract + Earle's salt solution. They were examined by phase-contrast microscopy and time-lapse cinephotomicrography. The results were compared with the appearance of the parasites in conventionally fixed and stained material.

Schizogony in both species proceeds in three ways: (1) the nuclei and, later, merozoites may be arranged in a peripheral layer around the schizont, the cytoplasm of which splits from the periphery to the centre, leaving a spherical residue after segmentation; (2) the peripheral layer with nuclei may be invaginated to form a double layer, after which the schizont breaks up into several islands; or (3) the parent cytoplasm breaks up directly into islands, in which the merozoites are usually arranged in rosette form. The merozoites, which are actively motile, are oval shaped and have a filament projecting from one pole; their nucleus encloses a nucleolus at one end, while a food vacuole and mitochondria are present in the cytoplasm. The exo-erythrocytic stages of *P. fallax* differed from those of *P. gallinaceum* in the curved shape of the merozoites and in their smaller number in schizonts. The merozoites emerged either singly through a small aperture in the segmenting schizont or by bursting of the latter. They invaded new host cells both actively and passively: in some cases their phagocytosis by macrophages was observed.

The appearance of the parasites is shown in numerous excellent photomicrographs. *C. A. Hoare*

DUNCAN, D., EADES, J., JULIAN, S. R. & MICKS, D. **Electron Microscope Observations on Malarial Oocysts** (*Plasmodium cathemerium*). *J. Protozoology*. Utica. 1960, Feb., v. 7, No. 1, 18–26, 23 figs. [15 refs.]

The authors describe the ultrastructure of oöcysts of *Plasmodium cathemerium* in *Culex fatigans* fed on infected canaries. This study is based on the examination by electron microscopy of thin sections of the midguts containing oöcysts, removed from mosquitoes from 3 to 10 days after the infective feed.

The oöcysts are enclosed in a structureless capsule, which is at first relatively thick but becomes increasingly thinner as the oöcyst grows, and partially disappears by the time the sporozoites are liberated. The capsule is indistinguishable from the elastic layer of the mosquito stomach wall, and is thought to be produced by the host rather than by the parasite. During the period of observation, the nuclei in the oöcysts were seen to increase in numbers, the whole structure appearing as a large multinucleate cell. Both the oöcysts and sporozoites contained mitochondria and endoplasmic reticulum, while their nuclei contained nucleoli. The sporozoites are invested in a membrane consisting of two layers, and contain rod-like inclusions of unknown nature, while in immature sporozoites short filaments arise from the surface of the body.

All these structures are illustrated in numerous micrographs. *C. A. Hoare*

BALL, G. H. & CHAO, J. *In vitro* **Development of the Mosquito Phase of** *Plasmodium relictum*. *Exper. Parasit.* New York. 1960, Feb., v. 9, No. 1, 47–55, 10 figs. on 5 pls.

The authors describe the complete sexual cycle of development of *Plasmodium relictum*, from gametocytes to sporozoites, observed *in vitro* in cultures of the stomach of *Culex tarsalis* or of isolated oöcysts, grown at 22–25°C. in a medium consisting of a basic salt solution buffered with phosphates and bicarbonates

and containing glucose, amino acids, B vitamins, purines, pyrimidines, chick serum and embryo extract.

Exflagellation of microgametocytes was observed in the stomach of a mosquito removed immediately after the mosquito had fed on an infected canary; oökinetes appeared after 24 hours and persisted for another day. Development from oökinete to young oöcyst was studied in the stomach removed from a mosquito that had fed 2–3 hours previously. During 24–48 hours it was cultivated together with blood cells and parasites scattered in the medium, after which it was transferred every 48 hours to fresh medium without these elements. Oökinetes appeared in the culture fluid 24 hours after the culture was started, and by the 4th day young oöcysts were appearing on the stomach wall. When small oöcysts (attached or free) were grown in culture, they increased three-fold in size up to 5 days, after which they ceased to grow. When older oöcysts were cultivated, they continued to develop until sporozoites made their appearance. However, attempts to infect clean birds with such mature oöcysts have failed.

It was thus possible to follow the sporogony of the parasite *in vitro* only in successive steps, but the ultimate aim of the authors is to achieve continuous development starting from a single parasite.

The stages of *in vitro* development are shown in a series of photomicrographs. [See also this *Bulletin*, 1958, v. 55, 633.] *C. A. Hoare*

SERGENT, Ed. Infection latente et prémunition dans le paludisme des passereaux à *Plasmodium relictum*. [**Latent Infection and Premunition in Malaria in Canaries infected with** *Plasmodium relictum*] *Arch. Inst. Pasteur d'Algérie*. 1960, Mar., v. 38, No. 1, 1–6.

In 60 years the author has inoculated 6,000 canaries with *Plasmodium relictum*; except for 6% which die, the survivors pass into a condition of premunition. The duration of this state is the subject of the present study in which 527 birds were examined. The average life of a canary in Algiers is 8 years, and 3 birds of this group exhibited parasites 8 years after inoculation, 13 after 7 years, 28 after 6 years, 37 after 5 years, 79 after 4 years, 127 after 3 years, 146 after 2 years and 152 during the first year.

46 canaries with the latent infection were re-inoculated with the homologous strain, and none showed an acute response, only a few showing scanty parasites fleetingly. Such resistance is as apparent 48 months after infection as after one month; the host-parasite relationship may be termed " mutualism ".

P. C. C. Garnham

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—*human, animal;* American—*Chagas's disease and other trypanosome infections. In each form the following order is followed:*—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.*

NIGERIA, NORTHERN. MINISTRY OF HEALTH. **Sleeping Sickness Service: Annual Report for 1959.** 18 mimeographed pp. + 10 pp. of tables & 1 map. 1960: Kaduna.

During 1959 4,536 cases of sleeping sickness were notified from various sources. This is the lowest total yet reported, and it compares with 4,862 notified in 1958 [this *Bulletin*, 1960, v. 57, 343]. As reported previously, the patients detected during mass survey are highly infective since they have circulating trypanosomes but are not ill enough to seek treatment, while those voluntarily attending clinics are frequently in intermediate or late stages of the disease. The declining authority of the chiefs jeopardizes control because they cannot ensure attendance at surveys and cannot produce absconding patients. On diagnosis pentamidine isethionate is now given to clear parasites from the blood so that the reservoir is reduced and the patient, if uncooperative, is a danger to himself alone. Benue Province, as formerly, provides about one-third of all cases. In the area between Kaduna and Gbako rivers persistence of the disease has been combated with some success by frequently repeated surveys in order to eliminate the reservoir of infection.

The final bush clearance in the Kano-Katsina-Zaria scheme has been completed, a total of 3,204 miles. The present principle of fly control is barrier clearance of stretches of the rivers, the blocks between being allowed to regenerate and any re-invasion being controlled by residual insecticide. This is economically practicable whereas annual reslashing of thousands of miles of river vegetation is not. A 5% suspension of 50% water-dispersible DDT applied to all riverine vegetation to a height of some 7 feet eliminated fly for 5 months. Insecticide applied to the riverine haunts of *Glossina morsitans* and *G. tachinoides* at the height of the dry season produced satisfactory control for several months. One application of 4% dieldrin in isolated blocks of river vegetation eradicated fly, while in a high forest sector spray of the periphery and paths only was successful. Rice farming necessitates sheer clearing, and control by this means has been encouraged by issuing free rice seed. A series of appendices gives the usual data concerning the distribution of sleeping sickness cases.

T. H. Davey

TANGANYIKA. MINISTRY OF HEALTH. **Sleeping Sickness Service: Annual Report 1959** [APTED, F. I. C.]. 39 mimeographed pp., 1 folding coloured map. 1959, Dec: Tabora.

The 1958 report predicted a general increase in sleeping sickness [this *Bulletin*, 1960, v. 57, 13], and 827 new cases were reported in 1959 compared with 555 in 1958. The disease has, however, remained under control. The increase has

resulted firstly from the stopping of communal clearing and compulsory population concentration and, secondly, from general development and uncontrolled settlement in sleeping sickness areas. As development proceeds the fly and the disease will disappear. This new policy has been made possible by the efficacy of modern treatment together with a good case-finding organization. In most parts of the territory prevention consists largely in maintaining existing settlements, and any general return to dispersal throughout the bush would cause a large-scale epidemic. Control must be based on restrictions designed to reduce daily man-fly contact and this necessitates supervision of settlement. Present political attitudes towards restrictions make the work of the settlement officers more difficult.

The returns show that only in East Lake Province has sleeping sickness incidence declined, and that the *Trypanosoma gambiense* area north of Kigoma in the Western Province is now free from infection as a result of mass pentamidine prophylaxis and insecticidal control of *Glossina palpalis*. The Kasulu area evacuated during the 1958 epidemic is again largely repopulated as a result of bush clearing. Clinical trials of new drugs are continuing. Nitrofurazone is useful in late cases resistant to Mel B but it may cause polyneuritis and even paralysis. Berenil is effective in very early *T. rhodesiense* infections. The Department of Tsetse Survey and Reclamation has now been incorporated in the Veterinary Department. Much of its work is in the veterinary field, and tsetse control is becoming more important because of development.

This very interesting report concludes with a series of tables giving data concerning the cases diagnosed, and an appendix which discusses the infection and death rates in women and children. *T. H. Davey*

Moçambique, Missão de combate às tripanossomíases. Relatório anual de 1958 [De Andrade Silva, M. A.]. [**Annual Report for 1958 of the Trypanosomiasis Commission**] 106 pp., 1 folding coloured map & 9 figs. on 5 pls. 1960. Lourenço Marques: Imprensa Nacional de Moçambique.

In his introductory note to the Annual Report of the Trypanosomiasis Mission the author expresses grave anxiety about the extension of tsetse species, especially *Glossina morsitans*, which has extended in the Zambesi valley towards the east and may well invade the Limpopo valley with consequent danger to thousands of bovines. In addition *G. pallidipes* appeared for the first time in the area bordering Southern Rhodesia. Mention is also made that the whole future of the Mission is endangered by lack of staff to carry out their very wide duties which, besides medical (including hospital treatment), involve roadmaking (access to villages), installation of water supplies, etc.

Glossina spp. occur in the province—*G. morsitans*, by far the most numerous and dangerous, *G. pallidipes*, *G. brevipalpis*, and *G. austeni*. There is an extensive description of the forest and other vegetation and it is demonstrated vividly how rail and motor traffic help in the dissemination of the flies; here the various inspection barriers and disinfestation rooms do good work but it is emphasized that inspection in the open air greatly diminishes the chances of capturing glossinae.

As regards human trypanosomiasis, in 2 sectors the population could not be examined through lack of staff; in 7 other sectors where the total population

was 663,828, the number examined was over 300,000 and 167 new cases discovered, 21 in the blood-lymph phase and 143 in the nervous phase (3 died before lumbar puncture). 332 patients were treated, 17 died. The percentage of patients treated by Arsobal is increasing yearly owing to the good results obtained. 1,662 persons working in endemic areas were given prophylactic injections of pentamidine.

Regarding animal trypanosomiasis, bovines, sheep, goats, swine, and 1 donkey were found positive. *Trypanosoma congolense* was the parasite most frequently present except in pigs (*T. simiae*). Berenil was found to be very active against *T. congolense* and *T. vivax*, while Prothidium was an effective prophylactic.

The laboratory work included examination of some 70,000 blood films for parasites; *Plasmodium falciparum* was the most frequently found, with *P. vivax* next, then *Dipetalonema perstans* and *T. rhodesiense*. Nearly 50% of the urine specimens were positive for *Schistosoma haematobium* and 30% of the faeces specimens for *S. mansoni*.

The campaign for the destruction of wild animals continued and since it started in 1949 over 63,000 have been shot. Birds and snakes (*Naja* sp.) were among the animals found positive for trypanosomiasis.

The author points with justifiable pride to the ever-increasing acreage brought into cultivation through vegetation and fly control but again emphasizes the danger of the spread of *G. morsitans*. This is leading to close cooperation with the corresponding department of Southern Rhodesia.

[When the task the Mission has to do in the province is set against the staff available the difficulties are apparent; this is especially unfortunate in view of the extension of *G. morsitans*. The report is a detailed, careful and unemotional summary of an immense amount of good work done and deserves to be widely read, but it would be helpful to those outside the province if in future a map of the whole province with the health administrative regions into which it is divided could be supplied. Thereby it would be possible to follow conditions in the various divisions more closely.] *W. K. Dunscombe*

BAKER, J. R. **The Influence of the Number of Trypanosomes inoculated on the Prepatent Period of the Subsequent Trypanosomiasis in Laboratory Rodents.** *Ann. Trop. Med. & Parasit.* 1960, Apr., v. 54, No. 1, 71–4, 1 graph. [12 refs.]

2 strains of *Trypanosoma rhodesiense*, one monomorphic and the other polymorphic, were tested by injecting rats, mice and guineapigs. The prepatent period was found to decrease as the number of organisms in the inoculum increased. *W. E. Ormerod*

DESOWITZ, R. S. **Denaturant Effect of Basic Trypanocidal Drugs on the Protein of Cell-Free Trypanosomal Extracts.** *Exper. Parasit.* New York. 1960, June, v. 9, No. 3, 233–8, 2 figs. [10 refs.]

An extract of washed trypanosomes was prepared by shaking with ballotini beads and saline in a Mickle disintegrator for half an hour and centrifuging to deposit the beads and debris. The supernatant fluid constituted the extract. This extract was mixed with 2 volumes of drug solution and allowed to stand

for 5 minutes. It was then centrifuged to throw down the precipitate which was removed and washed. By this procedure it was found that Berenil, pentamidine, ethidium and Antrycide in 0·5 *M* solution precipitated part of the trypanosome protein (*T. gambiense*, *T. brucei* and *T. rhodesiense*) but suramin and tryparsamide did not. Berenil and the others were tightly bound to the denatured protein and could not be washed off. A Berenil-resistant strain of *T. rhodesiense* bound about 3·34 mgm. Berenil to 10 mgm. precipitated protein, but a (more recent) normal strain of *T. rhodesiense* bound only 2·16 mgm. Berenil per 10 mgm. protein. Berenil precipitated up to 65% of the protein present. Antrycide, ethidium and pentamidine bound 55–65% of the protein present. If the complex of (0·2 mgm.) Berenil plus (1 mgm.) protein per 100 gm. was injected into rats subcutaneously, and the rats were challenged 4 days later with an inoculum of *T. gambiense*, the infection was partially suppressed compared with controls; similarly with rats given Antrycide plus protein. The protein fraction denatured by these drugs seems to be a glycoprotein.

F. Hawking

INOKI, S. & MATSUSHIRO, A. **Transformation of Drug-Resistance in *Trypanosoma*.** *Biken's J.* Osaka. 1960, Mar., v. 3, No. 1, 101–6, 5 figs.

The authors have stated that akinetoplastic forms of a pararosaniline-resistant strain of *Trypanosoma gambiense* did not multiply even when the drug was administered in dosage which produced them in the sensitive strain, and have suggested the use of a method for estimating drug resistance by observing the fluctuation in akinetoplastic forms as a result of drug treatment. In the present investigation a pure strain of *T. gambiense* was established from a single parasite and it was found that less than 1% of the population occurred as akinetoplastic forms. A pure strain of the parasite resistant to pararosaniline was similarly prepared. About 4 hours after treatment of the normal and resistant strain with 10 mgm. of the drug the number of akinetoplastic forms was respectively about 20% and 5% of the population. This difference served as an indication of the degree of drug resistance. Transformation of a normal to a resistant strain is now claimed to have been effected, by exposing isolated parasites of the normal strain to a homogenate of the resistant strain (free from viable parasites). The degree of resistance was determined by the above method based on the appearance of akinetoplastic forms. The conferment of resistance was prevented by the addition of deoxyribonuclease to the lysate which was presumed to break down the transforming agent (deoxyribonucleic acid). The acquired resistance appeared to be stable during further passages in mice.

[The statement of the authors that no report on transformations in micro-organisms other than bacteria is available is incorrect. The abstracter described his experiments at a conference in Rutgers University in January 1960 (before the present paper was submitted for publication) in which some degree of resistance was conferred on a normal strain of *T. rhodesiense* by DNA isolated from an atoxyl resistant strain. Also HONIGBERG and READ (*Science*, 1960, Feb. 5, 352) claimed to have transferred virulence from one strain of *Trichomonas vaginalis* to another by a method similar to those described by the present authors.

The above results suggest that trypanosomes treated in the manner described may undergo genetic change. It is however not clear from the experimental data that the changes described should be accepted as a transfer of resistance because pararosaniline has a very low range of activity and therapeutic tests were not carried out. Since the authors report that the akinetoplastic forms of *T. gambiense* do not multiply there must be a wide variation in the day-to-day occurrence of these forms. Experimental details are lacking to show whether this was taken into account.] *J. D. Fulton*

INOKI, S., TANIUCHI, Y., MATSUSHIRO, A. & SAKAMOTO, H. **Multiplication Ability of the Akinetoplastic Form of** *Trypanosoma evansi*. *Biken's J.* Osaka. 1960, Mar., v. 3, No. 1, 123–7, 1 fig.

The authors have investigated the possibility that akinetoplastic forms of *Trypanosoma evansi* can multiply in the mouse host. They claim to have shown that this is not the case with *T. gambiense*. A pure line of each species was established by isolation of a single organism and the production of akinetoplastic forms was then studied. The number of these forms which were dividing, as judged by the appearance of two nuclei, was also determined. In an experiment in which 3 strains of *T. evansi* were isolated from single organisms 2 of these strains were composed predominantly of kinetoplastic forms while in the third strain no kinetoplastic forms were present. By following the rate of multiplication in mice it was found that both kinetoplastic and akinetoplastic forms multiplied at the same rate. In *T. gambiense* segmenting forms were only seen in those parasites which possessed a kinetoplast. *J. D. Fulton*

GLASGOW, J. P. **Variations in the Venation of** *Glossina* **Wiedemann (Diptera: Muscidae).** *Proc. Roy. Entom. Soc. of London*. Ser. A. 1960, July 15, v. 35, Pts. 4/6, 49–57, 4 figs. on pl. & 1 text fig.

11 variations in the wing venation of *Glossina* sp. are described, 9 being stub veins and 2 being gaps in normal veins. The incidence varies between sexes and in different species. The variations may occur on both wings but are usually only on one.

The incidence of variations varies at different times of the year, being most common after the hottest months. It was shown that high temperature, applied throughout pupal life, can induce these variations. Some trial matings provided no evidence that the variations could be inherited in a simple Mendelian way.

J. R. Busvine

BARRASS, R. **The Settling of Tsetse Flies** *Glossina morsitans* **Westwood (Diptera, Muscidae) on Cloth Screens.** *Entomologia Exper. et Applicata*. Amsterdam. 1960, Mar., v. 3, No. 1, 59–67, 3 figs. [29 refs.]

One of the routine methods of catching tsetse flies is the use of settling screens. The attractiveness of different coloured screens was investigated in an area of the Zambesi valley in Southern Rhodesia. The screens used were 6 ft. × 3 ft., and all screens were carried for 1,000 paces, a stop being made every 50 paces for the counting and collection of flies.

The majority of flies caught were *Glossina morsitans,* and *G. pallidipes* accounted for only about 3% of the total catch. It was found that more flies settled on the darker side of a screen than on the lighter side, but the flies preferred the sunny side of a screen to the shaded side. When black, white and black/white striped screens were compared, many flies were seen to settle on the black but few on the white screen. The number of flies landing on the two sides of a screen was nearly the same when both sides were identical. But when, as in the case of black/white screens, the two sides were different, the side with the most black on it appeared to be more attractive and the number of settling flies decreased as the percentage of white on a screen increased. The critical factor in the avoidance of black/white screens appeared to be the breaking up of the black surface.

The bearing of these results on tsetse behaviour and host preference is discussed. *M. G. R. Varma*

GARNHAM, P. C. C. **Blood Parasites of Hippopotamus in Uganda.** *East African Med. J.* 1960, July, v. 37, No. 7, 495.

Examination of blood films from 137 hippopotamus shot during control operations in a national park in Uganda revealed the presence of trypanosomes in 2 animals, one of which also harboured a treponema.

The trypanosomes were short (8μ) with a rounded posterior end, a central nucleus and a kinetoplast situated 1μ from the end as a round dot on the edge of the cytoplasm. There was poor development of the undulating membrane and the flagellum stopped at the anterior tip of the trypanosome. These features suggest that the parasite belongs to the *T. congolense* group and may be *T simiae.* It is possible that the hippopotamus is a reservoir of *T. simiae.* A single spirochaete of 9μ long with 6 coils was found in one animal. The appearance suggested that it was one of the relapsing fever group and not a contaminant.

KLEINE and TAUTE found trypanosomes in hippopotamus in the Lake Tanganyika area some 50 years ago (*Arb. Kais. Gesundheitsamte*, 1911, v. 31, 321), *Filaria hippopotami* was found in a hippopotamus in Uganda by LEIPER (*Proc. Zool. Soc.*, London, 1910, v. 1, 233) and the present author found this worm and *Hepatocystis hippopotami* in an animal from Northern Rhodesia [this *Bulletin*, 1959, v. 56, 132]. Neither of these parasites was found in the present collection. *H. J. O'D. Burke-Gaffney*

JAFFÉ, L. **Chagas' Disease in Bocas Del Toro, Panama. A Pilot Study.** *J. Trop. Med. & Hyg.* 1960, Aug., v. 63, No. 8, 195–6.

In this short note the author, from the Hospital of the United Fruit Company in Almirante, Panama, refers briefly to Chagas's disease in Latin America and notes that it is unlikely that the extent of the disease in Panama had been established. During 15 years in Almirante, in the isolated Province of Bocas del Toro on the borders of Costa Rica, he has seen many cases of heart disease, but almost none of endocarditis. Clinically the cases usually corresponded to chronic myocarditis; and since other common causes of heart disease did not

seem to operate, he sought another explanation, as it is necessary to do in countries where Chagas's disease is endemic.

From 1957 to 1959 sera were taken from a random group of patients with X-ray and clinical evidence of heart disease, who lived in rural areas outside the United Fruit Company's camp. Statistical evaluation was not possible [and the total number of sera is not stated] owing to difficulties associated with the keeping properties of the sera which had to be sent to the Gorgas Memorial Laboratory for complement-fixation tests. However, positive results were obtained with 11 sera. X-rays from these patients were sent to Hamburg and the heart shadows were confirmed as being pathological. One was considered as typical and 2 as possible Chagas's myocarditis.

The author points to the need for establishing how much of the myocarditis in the area is caused by Chagas's disease, but unfortunately facilities for the necessary cooperation between clinicians and serologists are not yet available in the remote region of Bocas del Toro. *H. J. O'D. Burke-Gaffney*

i. Osimani, J. J. Enfermedad de Chagas: Importante flagelo de las zonas rurales del Uruguay. [**Chagas's Disease. An important Scourge of the Rural Areas of Uruguay**] *Rev. Goiana Med.* 1959, Oct.–Dec., v. 5, No. 4, 339–56, 5 figs. [30 refs.]

ii. Torrico M., R. A. Enfermedad de Chagas en Bolivia. [**Chagas's Disease in Bolivia**] *Ibid.*, 375–87. [26 refs.] English summary.

iii. Rodriguez M., J. D. Epidemiologia de la enfermedad de Chagas en la Republica del Ecuador. [**Epidemiology of Chagas's Disease in the Republic of Ecuador**] *Ibid.*, 411–38, 8 figs. & 2 maps. [13 refs.] English summary.

1959 was the fiftieth anniversary of the discovery by Chagas of the disease which bears his name and this issue of this very interesting journal is devoted to a description of various aspects of the disease in the Americas.

Although species of Triatominae are present not only in the Americas from latitude 42° N. to latitude 43° S. but also in Asia, the domestic vectors of the disease occur between latitudes 25° N. and 38° S. of the Americas, *i.e.* from Mexico to Argentina.

i. In Uruguay the disease is present in two-thirds of the country, the main coastal region being free (this includes the city of Montevideo). *Triatoma infestans* is the main vector, the index of infection by *T. cruzi* being around 30%. 4 other reduviids, especially *Eutriatoma rubrovaria* which is sylvatic, are also present. One-third of the patients in the acute stage are under 5 years of age. Osimani thinks that a better classification of the stages is: primary-secondary, latent, tertiary; the latent form may last for years. The complement-fixation (Machado-Guerreiro) test is reliable. The incidence of the disease is about 15% of the population examined, while of 60 dogs and cats examined 20 were infected. The construction and condition of the houses, in the rural areas especially, encourage the breeding of reduviids, while among wild animals a

marsupial was found naturally infected. Clinically, Romaña's ophthalmo-glandular sign was found to be of great diagnostic help, often accompanied by a localized swelling at the point of entry of the infection. Among preventive measures described are improvement of rural housing and the use of insecticides, especially Gammexane (500 mgm. gamma isomer per sq. metre) which gave better results than either DDT or a mixture of 2% chlordane and 2·5% DDT.

ii. Torrico states that 6 genera of the sub-family Triatominae covering 13 species have been found in Bolivia. *T. infestans* is the most widespread and important and has an infection rate by *Trypanosoma cruzi* approaching 100% in some areas. So far only 1 province in the whole country has been found free. In addition to *T. infestans*, *T. sordida* and *T. guasayana* have also been found in association with human habitation; the remaining 10 species are sylvatic. Dogs, cats and cavies are the most important domestic reservoirs, cavies especially, while a marsupial, *Didelphis paraguayensis*, is the main sylvatic reservoir. The disease is not however only rural and suburban but also occurs in the towns where house construction and housing conditions may also be very bad and provide favourable breeding places. Emphasis is laid on the value of Romaña's sign. Further investigations into the actual and true incidence of the disease are urgently necessary.

iii. The forking of the northern end of the Andean chain divides Ecuador into 3 regions: (a) western coastal; here the only reduviid of importance is *T. dimidiata*; (b) central high mountain region; (c) eastern, much of which is tropical jungle. The western region is the only one affected by Chagas's disease. The structure of the houses and general housing conditions provide suitable breeding places everywhere. The main animal reservoir is a marsupial which, originally sylvatic, has now become semi-domesticated living in large numbers in cities. It has a very high parasite rate. Clinically most of the cases of the disease occur in the age-group 0–5 years, and the city of Guayaquil appears to be the main source of infection, though a new possible focus has been found in the central (inter-Andean) region. The Machado-Guerreiro test has proved very useful in diagnosis but it is possible that both leprosy and muco-cutaneous leishmaniasis may influence the reaction. Rodriguez emphasizes that at present an opossum is the principal animal reservoir in his country, but besides *T. dimidiata*, the other species of *Triatoma* found in the central region may be dangerous, as experimentally they are efficient vectors.

[The very wide extent of the various vectors and the extensive animal reservoir provided by marsupials (and the armadillo ?), compared with the small number of persons reported infected (about 1,600 in the 3 countries altogether), emphasize the point made by each author that detailed investigation into the actual incidence is necessary. There is most certainly no cause for complacency.] *W. K. Dunscombe*

PHILLIPS, N. R. **Experimental Studies on the Quantitative Transmission of *Trypanosoma cruzi*: Considerations regarding the Standardization of Materials.** *Ann. Trop. Med. & Parasit.* 1960, Apr., v. 54, No. 1, 60–70. [34 refs.]

Very little is known about the quantitative relationships governing the effectiveness of transmission of *Trypanosoma cruzi* by its triatomine vectors

(vector efficiency). However, before this can be determined it is necessary that laboratory strains used for experimental purposes should be stabilized in their behaviour and host-parasite relations. With this end in view the author has studied 3 Brazilian strains of *T. cruzi* maintained by intraperitoneal passages through inbred 4-week old C_3H-strain mice, which were inoculated with variable numbers of trypanosomes. The strains used in these experiments were (1) *BH* isolated from a patient in 1926 [this *Bulletin*, 1950, v. 47, 335], (2) *Sonya*, isolated in 1955 from *Triatoma* fed on a child [*ibid.*, 1957, v. 54, 547], and (3) *Y* isolated from 2 patients in 1950.

The pathogenicity of *BH* declined after successive passages with progressively fewer parasites, which gradually produced lower parasitaemia and less mortality. But pathogenicity remained unchanged when passage mice were inoculated with a constant number of trypanosomes. Strain *Y* became attenuated after cyclical passages (through vector), but its previous virulence was restored by passaging with increasingly larger numbers of trypanosomes in the inoculum. In both these strains the infection was characterized by progressive rise of parasitaemia. Infections with strain *Sonya* were always fatal, though they were not associated with an increase in the number of trypanosomes in the blood, but, as the dose of the inoculum was increased, the time taken to kill the host decreased progressively. There was generalized oedema due to localized multiplication of trypanosomes in the peritoneal cavity.

There appeared to be 2 types of *T. cruzi* infections. In one (*BH* and *Y*), pathogenicity is due to wide dispersal of the parasites, associated with their intensive multiplication; however, if the dose of inoculum is adjusted, infections with low parasitaemia and morbidity can be produced. In the other (*Sonya*), pathogenicity depends upon localization of reproduction in the reticulo-endothelial system and peritoneal cavity with inherent specific histotropism and terminal death. By reducing the number of trypanosomes death could be delayed, but not prevented.

In the author's opinion, laboratory strains can be characterized only " when the numerical factor of the number of trypanosomes inoculated is operating at a maximum ". The most reliable diagnostic feature is then represented by the " minimum lethal period ", which is 7 days for strain *BH*, 8 for *Y*, and 13 for *Sonya*. *C. A. Hoare*

MONTOREANO, F., RABENKO, J. & ABRAHIM, H. C. La cardiopatía chagásica. [**Cardiopathy due to Chagas's Disease**] *Rev. Asoc. Méd. Argentina.* 1960, July, v. 74, No. 7, 434–8. [14 refs.]

The following is a translation of the authors' summary:—

A study was made of 72 patients with histories of residence in an endemic area of Chagas's disease or having a primary lesion, signs of myocarditis and strongly positive laboratory evidence of this infection. The patients were grouped by age: 10 were patients aged 10 to 30 years, 48 were 30 to 60 and 14 were over 60 years old.

The difficulties of differential diagnosis in the different age-groups are discussed and the possibility is pointed out of the existence or co-existence of other diseases.

In the critical analysis of these observations an attempt is made to evaluate the symptoms and signs of diagnostic significance in heart affections due to Chagas's disease and some differential characteristics in relation to age are suggested.

[The radiological, electrocardiographic, ballistiographic and other features are discussed in detail.] *H. J. O'D. Burke-Gaffney*

YAEGER, R. G. & MILLER, O. N. **Effect of Malnutrition on Susceptibility of Rats to *Trypanosoma cruzi*. I. Thiamine Deficiency.** *Exper. Parasit.* New York, 1960, June, v. 9, No. 3, 215–22, 5 figs. [11 refs.]

There is still no effective chemotherapeutic agent for the treatment of Chagas's disease. In view of the effect of diet and nutritional status on various diseases the authors have studied the effect of thiamine deficiency on *Trypanosoma cruzi* infections in 4 groups totalling 40 rats. The Tulahuen strain of the parasite was used and maintained in C3H mice. The complete diet contained casein, dextrose, salts, corn oil, cystine, choline chloride and also fat- and water-soluble vitamin mix, the former being made up of corn oil with alpha-tocopherol, vitamins A and D and also menadione. The water-soluble group consisted chiefly of B-group vitamins.

This diet was given to a group of 10 rats, while a second group of 10 were given the same diet without thiamine and lost appetite. A third group of 10 rats received an amount of the complete diet equal to that consumed by rats in group II. The fourth group of 10 rats were like those of group III but their diet contained double the normal amount of vitamins. Water was given *ad lib.* and coprophagy was prevented. When rats of group II failed to gain weight half of each of the 4 groups were then inoculated with *T. cruzi* and the course of infection followed.

All thiamine-deficient rats finally died and histological studies were then made of tissues. It was observed that the infection was most acute in the thiamine-deficient animals and it is suggested that the vitamin was not an important metabolite. Rats in good nutritional state are not good hosts for *T. cruzi* but on the other hand are excellent hosts for African trypanosomes.

The various nutritional deficiencies which may arise as the result of poor diet require separate study.

Finally the authors suggest that the management of patients with Chagas's disease should include adequate nutrition. *J. D. Fulton*

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

MILOVANOVIC, M. & POPOVIC, D. Le Kala Azar en Yougoslavie. [**Kala Azar in Yugoslavia**] *Acta Parasitologica Polonica.* Warsaw. 1959, Sept. 15, v. 7, 559–72, 1 map & 2 graphs.

The first cases of kala azar in Yugoslavia were reported from Dubrovnik and Split on the Dalmatian Coast before the First World War; until 1939 the infection was confined to the neighbourhood of this littoral, but during the Second World War kala azar spread into the interior, and since 1944, 942 cases have been detected in Serbia, the disease extending north west in three epidemic waves along the valley of the Morava. A similar extension took place up the Vardar river in Macedonia, where kala azar was introduced by refugees from Greece.

Kala azar is most prevalent in the more densely inhabited regions, and occurs at an altitude of 50 to 100 metres, exceptionally at 600 metres (2,000 feet), usually between January and April. Three-quarters of the patients are under 5 years of age, though in Montenegro after the Second World War 46% of cases occurred in adults. The symptoms included irregular fever, enlargement of the liver, spleen and lymph glands, and haemorrhages; the death rate in Dalmatia was 10%, but was higher (26–30%) in the more recently infected areas of the interior.

The dog is a reservoir of the infection: 8% were infected in Split in 1936, 36% in Bar in 1938, 6% and 2% respectively in the city and environs of Dubrovnik in 1950. A later survey of nearly 2,000 dogs in the region of Bar proved entirely negative. The insect vectors are probably *Phlebotomus major, tobbi, perniciosus* and *chinensis* var. *simici.*

The use of DDT in antimalarial work has caused a great decline in the incidence of leishmaniasis, and in regions where it has been specially applied for the destruction of *Phlebotomus*, the disease has rapidly disappeared.

P. C. C. Garnham

MILOVANOVIC, M. & POPOVIC, D. [**Contribution to the Study of the Kala Azar Epidemic in PR Serbia**] *Bull. Inst. Hyg.* Belgrade. 1960, v. 9, Nos. 1/2, 23–7, 1 chart. [In Serbian.] English summary.

Kala azar has occurred in the coastal regions of Yugoslavia since the beginning of the century, and since the last war outbreaks of the disease have also been observed in Serbia, notably in 1946 (161 cases) and 1953 (234 cases), which were probably due to the introduction of the disease by German troops from Africa. The areas affected were investigated by the authors in 1956 and 1957. The mortality was unexpectedly high (30·4%), apparently on account of unsatisfactory treatment. No evidence of the existence of a carrier state was found in the examination of 115 persons living in contact with persons who had previously suffered from the disease. *D. J. Bauer*

HOU, Tsung-Ch'ang, TS'AO, Wei-Chi, CHUNG, Huei-Lan, WU, Chü-Ying & LIU, Yun-T'ao. **Human and Canine Leishmaniasis in Sian: with special reference to Significance of Kala-Azar Complement Fixation Test.** *Chinese Med. J.* Peking. 1960, Apr., v. 80, No. 4, 340–46, 1 fig.

The human and canine populations in the vicinity of the city of Sian in Shensi Province of Northern China were examined in 1957 and 1958 for evidence of visceral leishmaniasis. Of 1,021 dogs (chiefly "native") 23% gave a positive complement-fixation reaction. (This reaction was negative in a series of 33 dogs from Canton where kala azar is unknown.) 1% of the Sian dogs showed the parasite in bone marrow (ilium) smears (these animals also gave positive complement-fixation reactions). The globulin precipitation and formol gel tests gave fallacious results in dogs and are not recommended for use in these animals.

Nearly 8% of 331 inhabitants of the villages showed positive complement-fixation reactions; the sternal bone marrow was examined in 119 subjects and parasites were found in 3.

The incidence of the infection is declining as a result of mass treatment of patients, eradication of sandflies and destruction of infected dogs, but sporadic cases of the disease continue to occur and it is recommended that the campaign against the canine reservoir should be intensified.

[See also this *Bulletin*, 1949, v. 41, 342.] *P. C. C. Garnham*

INOKI, S., NAKANISHI, K. & NAKABAYASHI, T. **Study of *Leishmania donovani* with special reference to the Kinetoplast, Mitochondria, and Golgi Zone by Electron Microscope employing the Thin Section Technique.** *Biken's J.* Osaka. 1958, Dec., v. 1, No. 2, 194–7, 6 figs. on 3 pls. [19 refs.]

The authors describe the minute structure of the kinetoplast, mitochondria and Golgi apparatus in *Leishmania donovani*, the cultural [leptomonad] stages of which were examined by electron microscopy in thin sections of material embedded in metacrylate mixture. It was shown that the kinetoplast, which was rod- or crescent-shaped, had no visible connexion with the base of the flagellum. It measured 600–870 × 120–435 mμ and was enclosed in a thin membrane (8–15 mμ thick); along the long axis there was a dense striation consisting of granules, measuring 25–45 mμ × 15 mμ. The mitochondria within the cytoplasm were represented by bodies of various shapes, measuring 220 × 110–300 mμ, and containing 5–7 "cristae" (30–250 × 8–33 mμ). The Golgi apparatus was represented by several round vesicles (100 × 125 mμ—50 × 50 mμ).

The structures in question are depicted in a series of micrographs.

C. A. Hoare

ANDRADE, Z. A. Aspectos morfológicos da disproteinemia do calazar. [**Morphological Aspects of Dysproteinaemia in Kala Azar**] *Rev. Assoc. Med. Brasileira.* 1959, Dec., v. 5, No. 6, 413–21, 13 figs. [29 refs.] English summary.

The author states that kala azar is a disease in which there is a diffuse and progressive aggression against the cells of the reticulo-endothelial system (RES)

which respond by intense reticular hyperplasia and plasmocytosis, while at the same time there are marked changes in the plasma proteins, including the formation of a globulin which on electrophoresis moves more slowly than normal gamma globulin, though the plasma changes in this disease go much beyond this. He then reports histological studies on autopsy material from patients affected by the disease to test whether there is a paraproteinosis in kala azar. 3 patients showed inversion of the A/G ratio (other 2 not tested) and there is an extensive description of the histological findings. All the patients were *Leishmania* positive, all showed plasmocytosis, reticular hyperplasia, and the production of a PAS-positive staining material.

The author suggests that the RES, being the tissue mainly attacked in the disease, reacts by producing a hyaline protein material in the intercellular substance which forms an excellent basis for the production of collagen fibrils or their precursors, which in cases of long duration can result in partial or complete fibrosis of the organ affected, but the differentiation is not fibrocytic but plasmocytic, and hence can regress under specific treatment.

W. K. Dunscombe

NUSSENZWEIG, V. Contribuição para o estudo da reação de fixação do complemento na leishmaniose visceral, com antígeno extraído de bacilos de tuberculose. **[Complement-Fixation Reaction in Visceral Leishmaniasis using a Tubercle Bacilli Antigen]** 119 pp., 4 graphs. [Numerous refs.] English summary. 1958. Rio de Janeiro: Serviço Nacional de Educação Sanitária, Brazil.

After reviewing previous work on the use of the complement-fixation test (CFT) in kala azar with various antigens, the author describes in detail the advantages of using antigens prepared from tubercle bacilli for the test [this *Bulletin*, 1958, v. 55, 993, 994]. The materials and methods were as follows. Sheep erythrocytes were preserved in a solution containing 0·47 gm. citric acid, 1·33 gm. sodium citrate and 3·3 gm. glucose in 100 ml. distilled water. A 5% dilution was made before use, as well as anti-sheep haemolysin. The antigen was prepared in the form of a distilled water extract of dried tubercle bacilli extracted with acetone. The sera, most of which were taken from kala azar patients of Ceará, Brazil, were inactivated at 55°C. for 30 minutes. When necessary, the patient's serum was diluted from a pool of non-reacting sera.

A chapter is devoted to consideration of the *modus operandi* of this CFT and of the factors influencing it, such as temperature of incubation (optimum at 37°C.), diluent for sera (best results with pooled non-reacting sera), inhibitory effect of concentration of serum and antigen upon the reaction and anticomplementary properties of some kala azar sera. As regards the nature of the reaction between kala azar sera and tubercle antigen, the available evidence indicated that it is a cross-reaction, the bacilli and flagellates in question having common antigens.

In clinical trials this CFT proved to be very sensitive, for in 91 untreated patients with kala azar the reaction was negative in only 2 cases, while in 70% of positive sera the titre was higher than 100. Similarly, only a single negative reaction was obtained in patients tested at various periods after treatment. The CFT also proved to be more sensitive than the aldehyde test: in parallel tests

of 64 patients, the reactions were positive in 63 tested by the former method and in only 36 tested by the latter.

Non-specific reactions to the CFT with low titres were obtained with sera from patients suffering from espundia and Chagas's disease, as well as from apparently normal persons. Observations made on parasite-positive patients showed that the CF titre rose significantly with the duration of the disease and with the age of the patients, but there was no regular correlation between the titres and duration of the infection in various age-groups *C. A. Hoare*

ROSSAN, R. N. **Serum Proteins of Animals infected with *Leishmania donovani*, with special reference to Electrophoretic Patterns.** *Exper. Parasit.* New York. 1960, June, v. 9, No. 3, 302–33, 13 figs. [Numerous refs.]

" Analyses of the electrophoretic serum patterns of eight species of animals, representing a wide range of host response to *Leishmania donovani*, have indicated that the response of the susceptible animals (cotton rat, golden hamster, Chinese hamster, chinchilla, mouse and gerbil) was remarkably similar. Regardless of the number of parasites inoculated, the route of inoculation, or the source of parasite inoculum, these animals eventually showed a hypoalbuminemia and a hypergammaglobulinemia. The gerbil was an exception, in that the concentration of albumin tended to remain within the range of normal values. The values for the alpha and beta globulins and total protein concentrations were more variable than the other serum components investigated, but an apparent tendency was one of increased concentration. Superinfection of the gerbil tended to accentuate the previously observed changes.

" The guinea pig and rabbit, which are of low susceptibility to *L. donovani*, evidence little or no changes of their serum components. Both animals share the finding that the alpha globulins were increased during the course of infection.

" Further analysis of the gamma globulin area of the susceptible animals has shown that a gamma globulin of a slow migration rate is formed in the infected cotton rat, golden hamster and Chinese hamster. No such components were seen in the infected chinchilla, mouse or gerbil. However, there appeared to be a tendency for the peak of gamma globulin component to become bifid during the course of infection in the gerbil, such that one peak could be considered to have a migration rate similar to that observed for the infected cotton rat, golden hamster or Chinese hamster."

FULTON, J. D. **Treatment of *Leishmania donovani* Infections with Surface-Active Agents.** [Correspondence.] *Nature.* 1960, Sept. 24, v. 187, 1129–30.

Triton WR 1339 is an arylalkyl polyoxyethylene ether of phenol, and Macrocyclon is a polyoxyethylene ether. They are non-toxic surface-active agents and they have a suppressive effect in experimental tuberculosis of mice [*Bull. Hyg.*, 1955, v. 30, 752].

Three experiments were carried out to see if these compounds would have a therapeutic effect on infections of *Leishmania donovani* in hamsters. All three experiments yielded similar results. In the third experiment (which is typical)

30 hamsters were infected intraperitoneally with *L. donovani* and 10 of them were treated intraperitoneally with 125 mgm. of each drug 4, 7, 11, 14, 18 and 20 days later with 10 controls. They were killed 7 weeks after infection and counts were made of the number of parasites per oil-immersion field in smears of spleen. In the control group, 20–200 parasites per field were present; in the group treated with Macrocyclon 3 animals showed no parasites and the others showed less than 1 per field; in the group treated with Triton 6 animals were negative and 2 showed less than 1 parasite per field. Cultures of spleens were all positive showing that the infection had been controlled but not eradicated.

Similar results have been obtained by Dr. F. C. Goble of Ciba Pharmaceuticals Ltd., New Jersey. *F. Hawking*

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

Kratochvíl, I., Pospisil, R., Milosovicová, A., Polony, R. & Mitter-mayer, T. Terajši charakter epidemiológie škvrnivky na východnom slovensku. **[Recent Characterization of the Epidemiology of Typhus Fever in the East of Slovakia]** *Československ. Epidemiol., Mikrobiol., Imunol.* Prague. 1960, v. 9, No. 7, 455–8. [10 refs.]

The English summary appended to the paper is as follows:—

"The authors present a short characterization of the epidemiology of typhus in the East of Slovakia. In the present time typhus has lost its epidemic character and occurs in a form of relapses. During the years 1956–59 in the region of Košice, 17 relapses were diagnosed. They occurred 11–14, in two cases 41 and 44 years after the first attack of the disease. The authors are of the opinion that it is still actual to follow up the typhus."

Krynski, S. & Becla, E. Influence de la température sur l'activité toxique de *R. prowazeki* chez le pou. **[Influence of Temperature on the Toxic Activity of *Rickettsia prowazeki* in Lice]** *Arch. Inst. Pasteur de Tunis.* 1960, Mar., v. 37, No. 1, 3–12, 4 figs.

Lice in the experiments reported in this paper were inoculated intrarectally with varying concentrations of suspensions of the intestines of lice infected with *Rickettsia prowazeki*. The inoculated lice were kept at 32°C., 28°C., 24°C., 20°C. and 4°C. to study the effect of dosage and temperature on infection.

The results showed that the progress of infection depended on the number of specimens injected or their virulence as well as on the temperature at which the lice were maintained. Concentrated inocula and high temperatures turned the lice red very rapidly, this being due to the exudation of haemoglobin into

the body cavity as a result of excessive multiplication of the rickettsiae in the gut epithelial cells. There was a progressive reduction in the number of lice turning red with weaker inocula or lower temperatures or both, and very weak inocula did not have any effect 24 hours after inoculation in lice kept at 32°C.

M. G. R. Varma

JUMINER, B. Agglutinines anti-*Rickettsia* chez *Rattus norvegicus* à Tunis en juin, juillet et août 1959. [**Anti-Rickettsial Agglutinins in** *Rattus norvegicus* **in Tunis in June to August 1959**] *Bull. Soc. Path. Exot.* 1960, Jan.–Feb., v. 53, No. 1, 85–9.

The author refers to a previous study [this *Bulletin*, 1959, v. 56, 1226] in which he had found agglutinins to rickettsiae in sera from *Rickettsia norvegicus* in Tunis in November 1958–March 1959. There had been 20% positive with epidemic typhus antigen and 3% with murine. He was struck by the predominance of the former agglutinin in animals generally regarded as a reservoir of murine typhus only. As typhus is a disease with a seasonal incidence in winter in Tunis, the author repeated the tests on 272 sera from more *R. norvegicus* in the hot months of June to August 1959. The results now showed only 4% positive with epidemic typhus antigen and 9% with murine. Statistical analysis indicated that this reversal was significant. The percentage of sera positive for *Rickettsia burneti* remained unchanged at 2%.

The author links the findings with the epidemiology of epidemic and murine typhus and with the habits of the insect vectors; in winter, overcrowding and the use of thick clothing encourage lice, and in summer clothing is scanty and fleas are numerous. However, as the louse is regarded as a strictly human ectoparasite, it would seem that if epidemic typhus can occur in *R. norvegicus*, the vector would not be the louse.

The author raises again the question of whether there is a natural cycle of transmission of rickettsiae other than *R. mooseri* which involves rats and man and suggests that the flea may be a "mixed vector". So far, it has not been possible to isolate rickettsiae from the brains of serologically positive rats.

H. J. O'D. Burke-Gaffney

IATSIMIRSKAIA-KRONTOVSKAIA, M. K., BOCHAROVA, T. V. & SOSNOVSKAIA, M. **The Possibility of the Prolonged Carriage of** *Rickettsia prowazeki*. **II. The Effect of Penetrating Radiation on the Isolation of** *Rickettsia prowazeki* **from Animals with Experimental Typhus.** *J. Microbiol., Epidemiol. & Immunobiol.* London, 1959, v. 30, No. 11, 93–6. [16 refs.] [Translated from Russian.]

Guineapigs and rabbits which had been infected with *Rickettsia prowazeki* were exposed to heavy doses of X-rays (200–800 r) 6 to 38 months later. Attempts to isolate rickettsiae from the blood and tissues of the irradiated animals were unsuccessful, and the titre of complement-fixing antibodies remained unchanged.

R. S. F. Hennessey

SHMELEVA, E. I. **The Effect of Cortisone on the Course of Infections of the Typhus Fever Group in Experimental Animals. III. The Effect of Cortisone on the Course of Epidemic Typhus in Experimental Animals.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1959, v. 30, No. 11, 87–93. [Translated from Russian.]

In guineapigs treated with cortisone and infected with *Rickettsia prowazeki*, the onset of fever was delayed, rickettsiae were detected earlier and persisted longer in the tunica vaginalis, and rickettsiaemia was intensified and prolonged, by comparison with findings in untreated animals. The development of immunity was not inhibited by cortisone; specific complement-fixing antibodies appeared more slowly but titres after 3 weeks and at 3 months were higher than in control animals.

Asymptomatic infection with *R. prowazeki* in white rats seemed to be slightly intensified by cortisone treatment, antibody titres being higher in treated animals than in controls.

Cortisone had no detectable effect on the resistance of white mice to infection with *R. prowazeki*.

[See also this *Bulletin*, 1960, v. 57, 1255.] *R. S. F. Hennessey*

VERCAMMEN-GRANDJEAN, P. H. Introduction à un essai de classification rationnelle des larves de Trombiculinae Ewing 1944 (Acarina-Trombiculidae). **[Introduction to an Attempted Rational Classification of the Larvae of Trombiculinae]** *Acarologia*. La Varenne. 1960, Oct., v. 2, No. 4, 469–71, 2 folding pls.

SHEPARD, C. C. & GOLDWASSER, R. A. **Fluorescent Antibody Staining as a means of detecting Rocky Mountain Spotted Fever Infection in Individual Ticks.** *Amer. J. Hyg.* 1960, July, v. 72, No. 1, 120–29, 1 pl. [11 refs.]

Smears from 15 out of 20 laboratory-bred nymphs of *Dermacentor andersoni* which had fed 11 months previously on guineapigs infected with *Rickettsia rickettsi* contained material which was identified by fluorescent antibody staining as specific antigen of *R. rickettsi*. Of these 15 ticks, 11 were infective to eggs; 2 of the 4 ticks which were not infective to eggs induced immunity to *R. rickettsi* when inoculated into guineapigs, a finding which it is thought may be due to the presence of non-viable rickettsial antigen in the ticks. No material reacting with fluorescent antibody was found in 5 ticks, but 1 of these was infective to eggs; none of them induced immunity in guineapigs.

Material identified as *R. rickettsi* antigen was found in smears from 4 out of 144 *D. andersoni* collected in an area where the incidence of Rocky Mountain spotted fever was high; these 4 ticks were the only specimens in this collection which subsequently proved to be infective to eggs. 91 ticks from an area where the incidence of spotted fever was very low were negative when examined for antigen by the fluorescent antibody method and for infectivity by egg inoculation. *R. S. F. Hennessey*

PHILLIPS, C. W., Jr., KIMBROUGH, G. T., WEAVER, J. A. & TUCKER, A. L. **Rocky Mountain Spotted Fever with Thrombocytopenia.** *Southern Med. J.* 1960, July, v. 53, No. 7, 867–9.

Although thrombocytopenia has been observed in other types of rickettsial disease, the authors state that its occurrence in a boy aged 6 years suffering from a grave attack of Rocky Mountain spotted fever is its first recorded observation in this disease. *Rickettsia rickettsi* is now known to be distributed widely throughout the eastern states of the U.S.A., the only exceptions being Maine and Vermont, from which the vector-reservoir, the dog tick *Dermacentor variabilis*, is absent.

The disease, after an incubation period of 2–14 days, begins with rapidly developing malaise, headache, photophobia and anorexia; high fever, delirium, myalgia and arthralgia then quickly follow. A characteristic rash appears on the 3rd to 4th day, and is seen initially on the ankles and flexor surfaces of the wrists. It then spreads centripetally to involve the entire body, including the palms, soles and oral mucosa. At first macular and bright pink in colour, it soon becomes papular and a little later petechiae also develop. The spleen usually becomes palpably enlarged. In the differential diagnosis, measles, glandular fever, meningococcal infection, blood dyscrasias, anaphylactoid purpura and drug eruptions, all require consideration. The appropriate diagnostic measures are the Weil Felix reaction, which will show a rise in titre of antibody to all 3 *Proteus* strains, most marked in the case of *OX19*—and does not therefore differentiate it from other rickettsioses—and the rickettsial complement-fixation reaction which is highly specific.

The patient whose case is reported, a white boy of 6 years, was admitted to hospital on the 7th day of his illness, at which time the rash was profuse, the spleen palpable and the Hess test positive. The platelet count was 21,550 per cmm. The sternal marrow showed a marked leukaemoid reaction, with a grave depletion in the numbers of megakaryocytes.

On treatment with chloramphenicol recovery followed within 6 days. Subsequent test showed that the thrombocytopenia was not attributable to sulphonamides or aspirin, with which he had been treated before admission to hospital.

[Leukaemoid blood reactions have long been recognized in severe fevers of the typhus group (DANIELOPOLU *et al.*, this *Bulletin*, 1940, v. 37, 567).]

J. H. Walters

REUSSE, U. Die Bedeutung des Q-Fiebers als Zoonose. [**The Importance of Q Fever as a Zoonosis**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1960, v. 11, No. 2, 223–62, 2 figs. [344 refs.]

The author has compiled in this paper a very thorough and much-needed review of Q fever considered as a zoonosis.

It is divided into the following headings:—history, systematics, resistance, chemical methods of control, control by physical methods, diagnosis, therapy and prophylactic inoculation, clinical appearances, Q fever infections in animals, epidemiology, regional distribution, the importance of domestic animals, the

importance of ticks as vectors, the present position of Q fever in Germany, and measures for combating the disease.

There is an immense bibliography of 344 references, including a considerable number of Russian papers. *Philip Manson-Bahr*

TRÜB, C. L. P., BOESE, W. & POSCH, J. Die Q-Fieber-Epidemie am Niederrhein 1958, Land Nordrhein-Westfalen. [**The Q Fever Epidemic in 1958 in the Lower Rhine Area in the Province of North-Rhine-Westphalia**] *Arch. f. Hyg. u. Bakt.* 1960, Feb., v. 144, No. 1, 48–73, 3 figs. [22 refs.]

In 1958 an epidemic of Q fever occurred in the province of North-Rhine-Westphalia, Germany, in which the infection originated from a cattle auction held in Krefeld. 2–3 weeks later a febrile illness occurred among 19 farmers who had visited the auction; further cases occurred and the disease was eventually diagnosed as Q fever by serological investigations. Persons who had attended the auction were traced, and it was found that 94 of a total of 426 (22%) had contracted Q fever. 515 cases were detected, and the total number of cases was estimated at 800–1,000. The incubation period in a group of 184 patients was 8–20 days in 73, 21 days in 35, and over 21 days in 76. The epidemic occurred in 3 waves; the first involved persons who had attended the auction and the second and third waves represented contact infections. Investigation of the cattle which had been sent to the auction showed that 5 animals possessed Q fever complement-fixing antibody, 4 of which were excreting *Rickettsia burneti* in the milk. Among 331 patients for whom clinical details were available the disease took the pneumonic form in 135 (40·78%), influenzal in 155 (46·82%), typhoid in 19 (5·94%), meningitic or encephalitic in 8 (2·42%), cardiovascular in 8 (2·42%) and the renal form in 6 patients (1·82%). 318 (89·4%) of 356 patients were males. *D. J. Bauer*

BOESE, W., TRÜB, C. L. P. & POSCH, J. Ergebnisse der serologischen Untersuchungen bei der Q-Fieber-Epidemie 1958 am linken Niederrhein, Land Nordrhein-Westfalen. [**Results of Serological Tests in the Q Fever Epidemic of 1958 in the Province of North-Rhine-Westphalia on the Left Side of the Lower Rhine**] *Zent. f. Bakt.* I. Abt. Orig. 1960, v. 179, No. 3, 325–35, 3 figs.

The authors report the results of serological investigations carried out during an epidemic of Q fever in Germany in 1958 in which the source of the infection was a cattle exhibition [see TRÜB *et al.*, above]. Among 192 patients who had visited the exhibition complement-fixing antibody titres of 10–640 were found and the main incidence of the infection was in May and June. Contact cases occurred among persons who had not visited the exhibition, with the main incidence in June and July, and the results of the examination of 208 sera are reported. A laboratory infection which gave rise to 5 contact cases of Q fever is described. *D. J. Bauer*

URBACH, H., SCHABINSKI, M. & LINDE, K. Stoffwechseluntersuchungen an *Rickettsia burneti* im zellfreien Nährsubstrat mit Hilfe der Warburg-Technik und der Bestimmung des assimilierten radioaktiven Phosphors. **[Investigations on the Metabolism of *Rickettsia burneti* in Cell-Free Media; O_2 and ^{32}P Uptake]** *Zent. f. Bakt.* I. Abt. Orig. 1960, v. 179, No. 2, 168–79, 2 figs.

An investigation has been made of the metabolic activity of *Rickettsia burneti* obtained from infected yolk sacs by differential centrifugation and resuspended in *p*H 7·0 buffer containing magnesium and manganese ions. The oxygen uptake of the rickettsial suspensions in the Warburg apparatus in the presence of sodium glutamate was twice as great as that of control preparations made from uninfected yolk sacs. No increase in the rate of oxygen uptake was observed in preparations from yolk sacs infected with influenza virus, and the excess respiration was therefore presumably that of the organisms themselves. After observation for 8 hours in the Warburg apparatus the rickettsial suspensions retained full infectivity for guineapigs. The oxygen uptake of rickettsial suspensions inactivated with formalin was not greater than that of preparations from normal yolk sacs. Incorporation of radioactive phosphorus by the rickettsial suspensions could also be observed. *D. J. Bauer*

RIBI, E. & HOYER, B. H. **Purification of Q Fever Rickettsiae by Density-Gradient Sedimentation.** *J. Immunology.* 1960, Sept., v. 85, No. 3, 314–18, 4 figs. [19 refs.]

"A rapid method for isolation and purification of Q fever rickettsiae is described. It consists of differential centrifugation of homogenates of infected yolk sacs or chick embryo tissue in M/1 KCl followed by sedimentation in continuous linear sucrose or glycerin gradients. Adequate yields of electron microscopically pure rickettsiae were obtained."

YELLOW FEVER

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

COLLIER, W. A. & DE WIT, M. Die Züchtung des Gelbfiebervirus 17D im Ascites des Krebs-2-Carcinoms. **[Cultivation of the 17D Strain of Yellow Fever Virus in the Ascites Form of the Krebs 2 Carcinoma]** *Antonie van Leeuwenhoek: J. Microbiol. & Serol.* 1960, v. 26, No. 2, 209–23, 11 figs. [47 refs.]

The 17D strain of yellow fever virus could be carried through more than 39 passages in mice in association with the Krebs 2 carcinoma. The titre of

the virus in the ascites fluid, as determined by intracerebral titration in mice, was around 2 log units. Infection with the virus caused some prolongation of survival time in mice inoculated intraperitoneally or intracerebrally with the tumour. *D. J. Bauer*

DENGUE AND ALLIED FEVERS

O'Gower, A. K. **Townsville Culicines as possible Vectors of Dengue and Allied Viruses among Local Feral Fauna.** *Australian J. Exper. Biol. & Med. Sci.* 1960, Feb., v. 38, Pt. 1, 1–9. [23 refs.]

"After an epidemic of dengue-like fever in Townsville in 1952, investigations were made to try to determine the possible vectors of the virus from the presumptive reservoir of flying foxes and/or migratory birds of the seashore to man. This was done by determining which mosquito species had fed upon flying foxes, upon birds, and upon man.

"Two thousand and twenty female mosquitoes of 32 species were collected, either attracted to bait (man, horse and flying fox), were caught in light traps, or recovered from resting sites. Of these mosquitoes, 713 were engorged with blood and precipitin-tested to determine the hosts upon which they had fed. The range of hosts was man, horse, ox, dog and fowl.

"Only five species, *T.* [*Mansonia*] *uniformis*, *A. vigilax*, *C. annulirostris*, *C. fatigans* and *C. sitiens* were implicated as being possible vectors of the virus from the presumed reservoir to man, and of them the prime suspects were *A. vigilax* and *C. sitiens*, for these two species were attracted to flying fox bait, they had fed upon both man and fowl and they were associated with mangrove swamps, in which flying foxes 'camp' during the day and in which migratory birds of the seashore roost at night.

"These findings are discussed with regard to the implicated vectors of Murray Valley encephalitis and Japanese B encephalitis, both of which are immunologically related to dengue fever."

Miller, J. K. **Colorado Tick Fever: Failure to isolate the Virus from** *Dermacentor variabilis* **on Long Island, N.Y.** *Pub. Health Lab.* 1960, May, v. 18, No. 3, 53–4.

See also this *Bulletin*, 1950, v. 47, 978 *bis*; 1955, v. 52, 624.

Johnson, E. S., Napoli, V. M. & White, W. C. **Colorado Tick Fever as a Hematologic Problem.** *Amer. J. Clin. Path.* 1960, Aug., v. 34, No. 2, 118–24, 1 fig.

Colorado tick fever is becoming commoner as more people spend outdoor holidays in the western States of America; and the incubation period of 3–6

days allows them sometimes to develop the disease at home. The high fever, with muscle, joint, and eye pains and headache, is not at first characteristic, but its remission on the 3rd or 4th, and its relapse on the 5th or 6th day, should arouse suspicion. There is usually no rash, but the spleen may be slightly enlarged. A very constant finding, however, is a granulocytopenia accompanying each bout of fever, with severe toxic granulation and an increase of juvenile forms; the lymphocytes show abnormal cells of the Türk or "virocyte" type. All the 4 patients described by the authors showed these features, and it was also established that the bone marrow showed a corresponding arrest at the myelocyte-metamyelocyte stage. One patient had a rash but this was due to sulphonamides. The peripheral blood picture, however, suffices for a presumptive diagnosis in exposed persons, which may be confirmed by viral isolation during the fever or complement fixation during convalescence. [Glandular fever, and in other parts of the world tick typhus, might be included as possibilities, since they can produce similar blood changes.] *Alan B. Raper*

RABIES

World Health Organization. Technical Report Ser. No. 201. **Expert Committee on Rabies. Fourth Report. 14–19 December 1959.** 28 pp. [Refs. in footnotes.] 1960. Geneva: Palais des Nations. [Sales agent for U.K., H.M. Stationery Office.] [1s. 9d.; $0.30; Sw.fr. 1.–.]

Recent advances in rabies research have necessitated re-appraisal and modification of recommendations made by the Committee in its third report [this *Bulletin*, 1957, v. 54, 809]. The present report—a self-contained document, retaining, unaltered, certain parts of that third report, as well as of the Committee's first and second reports [*ibid.*, 1951, v. 48, 32; 1955, v. 52, 149], and incorporating such modifications and additions as have been considered necessary—covers the items on the Committee's agenda in the order indicated in the following paragraphs.

For the rapid diagnosis of rabies there has become available the highly specific fluorescent antibody test, by means of which rabies virus antigens in the brains of naturally infected animals can be stained with fluorescent "tagged" or "labelled" antibody—the fluorescence observed on microscopic examination of tissue specimens so treated being evidence of specific antigen-antibody reaction. Experience with this method has shown that diagnosis can be established within a few hours and that there is close agreement between the fluorescent antibody and the mouse inoculation test results. Recent developments with respect to antirabies vaccines concern: the production of an inactivated duck-embryo vaccine, shown in experimental work to contain only minimal amounts of the factor(s) responsible for post-vaccination allergic encephalitis; the successful freeze-drying of phenolized nervous tissue vaccine, with preservation of the lyophilized product's antigenicity and increased stability on storage; and the availability, for HEP Flury and Kelev virus vaccines, of an

additional potency test, in the performance of which mice, inoculated intracerebrally with 0·03 ml. of 10^{-1} to 10^{-5} dilutions of the vaccine, are subjected 14 days later to intracerebral challenge with sufficient fixed or street virus to kill all the control mice; mice receiving up to 10^{-3} dilution of the vaccine should be protected. Methods of production and concentration of antibody in antirabies serum have been improved, and in experimental animals the use of antirabies gamma globulin, obtained by fractionation of hyperimmune horse serum, has been attended with success in the local treatment of wounds infected with rabies. As regards minimum requirements for the therapeutic potency of any antirabies serum, such can be met only if that serum is shown, on assay, to be equal to or better than the International Standard Serum, *i.e.* if it contains a minimum of 80 International Units per 1 ml.

For the prevention of rabies in man it is reaffirmed that in mild exposures a course of vaccine following appropriate local treatments of the wound is sufficient, whereas after severe exposures, and in all cases of unprovoked biting by wild animals, antirabies serum together with vaccine should be employed. In this latter connexion, because of the fact that if passive antibodies are maintained for too long a period by repeated doses of serum, or if less than 14 doses of vaccine are given even after a single dose of serum, there is definite interference by the serum with the antigenicity of the vaccine, it is recommended that in combined serum-vaccine therapy a single dose of serum, not less than 40 IU per kgm. of body weight, should be administered at the start of treatment, followed by a course of not less than 14 doses of vaccine; further it is suggested that, when this treatment is prescribed, 2 supplementary doses, preferably of a non-nervous tissue vaccine, should be given 10 days and 20 days, respectively, after completion of the usual vaccine schedule. For the prophylactic immunization of persons with unusual risk of repeated exposure and of nervous reactions resulting from repeated treatment there are now available 2 types of vaccine almost devoid of encephalitogenic properties, *viz.* the duck-embryo and the HEP chicken-embryo vaccine. There is good evidence that 3 intradermal doses of either vaccine given 5–7 days apart prepare the individual to respond to a later booster dose of the same vaccine administered several (preferably 2–6) months after the last preparatory dose. Revaccination with a similar booster dose should be practised every 2–3 years on persons who continue to be at risk and who have shown antibody response to any type of antirabies vaccination given in the past.

Recommendations in respect of rabies control in animals closely follow those made in the Committee's third report [*loc. cit.*]. On certain aspects of wild life rabies, however, the present report provides new information. In the United States, where foxes and skunks are the principal sylvatic vectors, most of the submaxillary glands of naturally infected foxes have been shown to contain rabies virus, but in no instance have salivary glands been found infective without concurrent infection of the central nervous system. Although, therefore, foxes are incapable of transmitting the disease as symptomless carriers, their transmitting potential is great, as evidenced by the fact that experimentally infected foxes have been seen to experience relatively long periods of illness, during which the saliva may be positive for rabies virus. Since 1953 over 350 isolations of rabies virus have been made in insectivorous bats from 24 States in widely diverse geographical areas of the U.S.A., as well as from one province in Canada; additional isolations have been reported from Turkey, Yugoslavia

and Western Germany. 5 human deaths from rabies in the U.S.A. and 1 in India have been attributed to infection by insectivorous bats.

For national control purposes the need for prompt reporting of rabies within a country is again stressed, and for international purposes the importance of making available information on the current situation of rabies throughout the world is reaffirmed. In this latter connexion it is suggested that such information be supplied to and disseminated by WHO. A number of suggestions for future research complete the body of the report: the development of a tissue culture system applicable to rabies virus production and serological tests; the development of highly antigenic non-nervous tissue vaccines capable of effective immunization with reduced inoculation schedules; and the provision of further evidence to establish the existence of inapparent rabies infections in nature and to determine whether a "silent" carrier state is possible in animals other than bats. These suggestions are additional to those made in the Committee's third report [*loc. cit.*] which are still in the course of implementation.

Three annexes to the report contain, respectively, a suggested international veterinary certificate of health and rabies vaccination for dogs and cats, a suggested case record for human rabies exposure, and a technique for the preparation of freeze-dried phenolized antirabies vaccine. *G. Stuart*

VYAZHEVICH, V. K. **A Case of Human Rabies due to Infection from a Wild Fox.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1959, v. 30, No. 10, 181–2. [Translated from Russian.]

GILDEMEISTER, H. Experimenteller Beitrag zum Problem der Tollwutinkubation. [**An Experimental Contribution to the Problem of the Incubation of Rabies**] *Arch. f. Hyg. u. Bakt.* 1960, May, v. 144, No. 3, 207–13.

Mice were infected intracerebrally with the CVS strain of fixed rabies virus, and the multiplication of the virus during the incubation period was studied by the intracerebral infection of mice with a fixed dilution of a suspension of the brains of animals killed at intervals up to 5 days after infection. The virus content of the brains was assessed from the survival time by the method of NIKOLITSCH [this *Bulletin*, 1958, v. 55, 395] after a preliminary confirmation of the observations of this author that the survival time is inversely proportional to the infecting dose of virus. After the injection of relatively small doses no virus could be detected in the brains until the second day after infection, and evidence of the occurrence of an eclipse phase was therefore obtained.

D. J. Bauer

SCHINDLER, R. Untersuchungen über die Bedeutung eines bei Karnivoren vorkommenden Speichelfaktors mit Hyaluronidase-ähnlicher Wirkung für die übertragung der Tollwutinfektion. Teil II. [**Investigations of the Significance of a Saliva Factor with Hyaluronidase-like activity occurring in Carnivores in the Transmission of Rabies Infection**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1960, v. 11, No. 1, 71–109. [Numerous refs.]

The author has previously shown [this *Bulletin*, 1957, v. 54, 676] that treatment with hyaluronidase will increase the mortality from experimental rabies

infections, and in the present work the effect of a hyaluronidase-like factor in the saliva of foxes and dogs has been similarly investigated. The factor could be found in extracts of the salivary glands of 11 different species belonging to 8 different genera of the order Carnivora, and was absent or present only in traces in representatives of the orders Herbivora, Rodentia, Omnivora, Primates, Insectivora and Marsupialia, with the exception of pigs and rabbits. The saliva factor of dogs showed appreciable hyaluronidase activity only on the acid side of neutrality, and determinations of the *p*H of fresh saliva showed that it was alkaline. An extract of fox salivary glands adjusted to *p*H 4·8 was mixed with fixed rabies virus and injected intramuscularly into 100 mice; 62 animals died, compared with 50 of a control group of 100 in which inactivated extract was used. The probability of significance of the increase in mortality was 0·1. No effect was observed with extract adjusted to *p*H 7·3. No increase in mortality could be observed in a similar experiment with dog saliva, and rabies virus was largely inactivated at the *p*H values which were most favourable for the hyaluronidase activity of the saliva. The saliva factor is therefore unlikely to have any facilitating effect upon rabies infection under natural conditions.

D. J. Bauer

RAINERO, L. Un caso di poliradicoloneurite da vaccinazione antirabbica. [**A Case of Polyradiculoneuritis after Antirabies Vaccination**] *Giorn. di Malattie Infettive e Parassit.* 1960, May–June, v. 12, Nos. 5/6, 288–90. [25 refs.]

The case occurred in a child aged 10 years in Genoa, after the 12th injection.

HUYGELEN, C. Étude comparative, chez le lapin et la souris, de l'immunité vis-à-vis d'une inoculation d'épreuve intracérébrale de virus rabique fixe. [**A Comparative Study of the Immunity in Rabbits and Mice against Intracerebral Challenge with Fixed Rabies Virus**] *Ann. Soc. Belge de Méd. Trop.* 1960, Apr. 30, v. 40, No. 2, 361–7. [15 refs.]

In the experiments described in this paper mice and rabbits, after their immunization with a phenolized vaccine of the Fermi type, were challenged with the standard challenge virus (CVS) strain of rabies virus. The vaccine—a 5% tissue suspension of emulsified brain from sheep inoculated with the Pasteur strain of fixed rabies virus at its 1,951st passage in rabbits—showed, on titration in mice, a virus titre (LD50) of 10^{-3} and was administered as follows: 60 mice received, as in the Habel test for potency, 6 injections, over a 14-day period, of a 1 in 10 dilution of the vaccine, *i.e.* 0·15 ml. of undiluted vaccine, equivalent to 0·75% of the average body weight (20 gm.) of the animals. 50 rabbits received daily 2 ml. of undiluted vaccine on 15 consecutive days, *i.e.* 30 ml. of undiluted vaccine, equivalent to 1·5% of the average body weight (2 kgm.). 15 days after the commencement of vaccination groups of mice were challenged intracerebrally with 0·03 ml. of serial ten-fold dilutions 10^{-1}–10^{-6} of CVS, the unvaccinated controls being similarly challenged with 10^{-5}–10^{-2} dilutions of the virus. Of the 50 vaccinated rabbits 7 died during vaccination and in 3 of these the presence of fixed virus was demonstrated in the brain by mouse inoculation. On the 30th day after commencement of vaccination 30 of the

remaining rabbits, in groups of 5, were challenged intracerebrally with 0·2 ml. of 10^{-2}–10^{-7} dilutions of CVS, the unvaccinated controls being similarly challenged, and at the same time 12 vaccinated rabbits and 10 unvaccinated controls were challenged intramuscularly with 1 ml. of CVS into the masseters: 4 vaccinated rabbits and 3 controls receiving a 1 in 20 dilution of the virus (group A), 8 vaccinated rabbits and 7 controls receiving a 1 in 80 dilution (group B).

Results, calculated by the Reed and Muench method, showed: that in mice the log LD50 of protection conferred by the vaccine was 4·68—a protection, therefore, against 47,860 LD50—a figure, when rounded to the nearest hundred, of 48,000; and that in rabbits, challenged intracerebrally the log of 50% end-points in the vaccinated animals was 5·25, while that in the unvaccinated controls was 5·00—*i.e.* that no protection had been conferred against intracerebral challenge. In rabbits challenged intramuscularly, however, 2 of the 4 vaccinated animals in group A survived challenge, while all 3 of the controls died; in group B, 6 of the 8 vaccinated rabbits survived challenge and only 2 of the 7 controls. These results prove that in rabbits the immunity conferred by vaccination against intracerebral challenge is negligible or nil, while that against intramuscular challenge may be considerable.

Because of its high cost and, as compared with the mouse, its lesser susceptibility to rabies virus; because also of the long incubation period of street virus rabies in rabbits, with consequential delay in diagnosis, and of the difficulty of obtaining in rabbits a significant degree of protection against intracerebral challenge, the rabbit has been progressively replaced by the mouse as the animal of choice for experimental work on rabies. *G. Stuart*

OSENINA, G. S. **Reactivity of Laboratory Animals following Injection of Various Types of Rabies Vaccine.** *Problems of Virology*. London. 1959, v. 4, No. 6, 58–64, 2 figs. [Translated from Russian.]

In his study of the neuroparalytic condition which occasionally complicates specific treatment with antirabies vaccines of nervous tissue origin, the author sought, by animal experimentation, to establish the role of fixed rabies virus in the development of that condition. To this end investigations were carried out on laboratory animals inoculated subcutaneously with dilutions of fresh-fixed virus (as in the method of Högyes) and with 2 variants of partially inactivated phenolized Fermi-type vaccine, with a virus titre of 10^{-1}–10^{-2} and of 10^{4}–10^{5}, respectively. The dilution method of Högyes was used for the inoculation of white mice and guineapigs: white mice received over a 12-day period 0·3 ml. of live virus, in a dilution of 1 in 1,000 during the first 6 days and in a dilution of 1 in 5,000 thereafter; guineapigs received over 7-day and 12-day periods 1 ml. doses of live virus, the first group being inoculated with a dilution of 1 in 1,000, the second group with a dilution of 1 in 1,000 during the first 6 days and with a dilution of 1 in 5,000 thereafter. The Fermi-type vaccine was administered to white mice, guineapigs and rabbits: white mice were injected daily with 0·5 ml. of a 1 in 5 dilution of vaccine of both variants over 10-, 15- and 30-day periods; guineapigs received 1 ml. doses of vaccine of both variants for 10 days; and rabbits received vaccine with a virus titre of 10^{-4}–10^{-5} in doses of 1–2 ml. (depending on weight) for 14 days. Reaction of the experimental

animals to the administration of the various vaccines was studied with respect to clinical manifestations of illness, changes produced in the central nervous system at various times after the commencement of vaccination, and the amounts of virus present in the brain tissue. The main results of the study follow.

As regards white mice: of 40 animals of 11–12 gm. weight injected with live virus vaccine, 6 developed pareses and paralyses of the hind limbs during vaccination, and in the central nervous system of these animals meningo-encephalitic lesions, oxyphilic degeneration in the cells of Ammon's horn, and signs of myelitis were found; in 3–4 weeks after the beginning of vaccination 17 further mice showed neurological signs and in these animals meningo-encephalitic lesions were also found, with a high concentration of virus (titre 10^{-6}) in the brain. In another experiment in which the live vaccine was injected into young mice of 5–6 gm. weight a paralytic state developed in most of the animals after only 5 injections; in the brains of these animals marked lesions of the encephalitic and encephalomyelitic type were found. The reaction in mice to the administration of partially inactivated Fermi-type vaccine are exemplified by the results of 2 experiments. In one experiment in which vaccine with a virus titre of 10^{-4}–10^{-5} was given to 18 animals for 15 days a paralytic state developed in 7 of the animals after 9–13 injections, and in the brains of the 5 investigated a high concentration of virus (10^{-5}) was present; in 2 mice killed after receiving their 5th injection it was shown that the virus had already entered the central nervous system, the virus titre in each case being 10^{-3}; in the 5 mice which did not become ill after 15 injections and were investigated between the 24th and 54th day no virus could be isolated from brain or spinal cord. Histological examination of the affected animals' central nervous system revealed a picture of diffuse meningoencephalomyelitis. In the other experiment in which vaccine with a virus titre of 10^{-1}–10^{-2} was given to 18 mice for 15 days, 2 of the animals died on the 4th day and 3 developed pareses after 9–12 injections; of clinically healthy mice investigated after 5–8 injections only 1, which died on the 14th day, had virus in its brain and that only in small amount (10^{-1}); marked histological changes were present in but few animals. By comparing the results of these two experiments on white mice it can be seen that, after inoculation with the low titre (10^{-1}–10^{-2}) vaccine, fewer animals developed clinically manifest illness, and that from the brains of animals so inoculated the virus could be isolated with less regularity and only in much smaller amounts.

As regards guineapigs and rabbits: illness, accompanied by neurological signs, was not observed, irrespective of the type of vaccine used and of the duration of the course of injections; in the central nervous system of the vaccinated animals no fixed rabies virus could ordinarily be found; in some animals only insignificant meningeal infiltration, vasodilation and swelling of the vascular endothelium could be demonstrated.

From his experiments on white mice—animals particularly sensitive to extra-cerebral infection with fixed rabies virus—the author concludes that after their inoculation with rabies vaccine containing live fixed rabies virus, the virus enters the central nervous system and actively multiplies, causing an illness of the encephalitic and encephalomyelitic type and sometimes transverse myelitis, with a fatal outcome in a large number of the experimental animals. Moreover, post-vaccination illness is particularly frequent in young mice. *G. Stuart*

PISKAREVA, N. A., IVANOV, N. P. & PISAREVA, N. A. **The Development of a Method of Inactivation of Rabies Vaccine by Ultraviolet Light. 2. Immunogenic and Antigenic Properties of Antirabies Vaccine Inactivated by Ultraviolet Light.** *Problems of Virology*. London. 1959, v. 4, No. 5, 119–24. [Translated from Russian.]

Part 1 of the authors' paper [this *Bulletin*, 1960, v. 57, 1050] described a method for the inactivation by ultraviolet light of a 5% tissue suspension of rabbit brain infected with the Leningrad strain of fixed rabies virus, and showed that after such inactivation, material with an initial infectivity of 7·0 log LD50 yielded a UV vaccine, which gave a resistance index of 5·0 log and mouse sera with a neutralization index of 6·0 log. Part 2 compares the immunogenic and antigenic properties of this UV vaccine with those of Fermi-type vaccine and Philips vaccine.

Judged by the findings obtained by intracerebral titration of the challenge virus in immunized white mice, the immunogenicity of the UV vaccine, with resistance indices between 6,918 and 100,000, proved superior to that of both the Fermi and Philips vaccine, with their resistance indices between 100 and 1,479 and between 1,622 and 3,020, respectively, and was shown to exceed, to a considerable degree, the official requirements for production batches of rabies vaccine. The inmmunogenicity of the UV vaccine was also tested by intramuscular infection of immunized white mice with a lethal dose (0·2 ml. of a 1 in 10 dilution) of street virus injected 21 days after the commencement of immunization; all 20 immunized animals survived the intramuscular challenge; all 20 control animals died.

The antigenicity of the vaccine was also determined by the rise in neutralizing antibody titre in the blood of immunized rabbits. In one experiment the animals received subcutaneously 1 ml. of 5% UV vaccine daily for 6 days, while the control group received the same dosage of Fermi vaccine. Sera of the immunized animals collected on the 5th, 10th, 15th, 30th and 65th days were examined in neutralization tests. Results showed the sera of rabbits immunized with UV vaccine to have neutralization indices of 2·33 log on the 5th day, 4·5 log on the 10th day and 6·0 log on the 15th, 30th and 65th days and the sera of rabbits immunized with Fermi vaccine to have indices of 3·0 log on the 10th day, 4·5 log on the 15th day and 6·0 log on the 30th and 65th days. After immunization with 5% UV vaccine, therefore, earlier antibody formation was observed. In another experiment, groups of rabbits (4 in each group) were immunized with 0·5% UV vaccine, Fermi vaccine and Philips vaccine, respectively, in doses of 1 ml. in courses of 3 days, with intervals of 3 days between each course (altogether 9 inoculations). The neutralization indices in the sera of animals on the 10th and 90th day after the beginning of immunization with UV vaccine proved to be 3·5 and 4·25 log, with Fermi vaccine 2·5 and 4·25 log and with Philips vaccine 2·67 and 4·37 log, respectively. After the last serum sample had been collected all 3 immunized groups and a control group of rabbits were infected intramuscularly with street virus: immunized rabbits received 2 ml. of a 10^{-2} dilution of virus (32 LD50) and the control animals 2 ml. of 10^{-2}, 10^{-3} and 10^{-4} dilutions; all the immunized animals remained well, while all 4 controls infected with a dilution of 10^{-2} of the virus became ill, as well as 3 of 4 infected with a dilution of 10^{-3} and 1 of 4 infected with a dilution of 10^{-4}.

The immunogenicity and antigenicity of dried UV vaccine prepared from a 5% brain suspension in 10% sucrose solution were also determined before and after desiccation and after 6 and 12 months' storage at room temperature (18–25°C.). Results showed the resistance index and the neutralization index at these times of testing to be, respectively, 4·13 and 5·5 log, 4·0 and 5·5 log, 3·96 and 5·5 log, and 4·13 and 4·67 log. By comparison, Fermi vaccine tested at the time of its preparation and 4, 6 and 8 months after storage at 4–6°C. showed the resistance index and the neutralization index at these times to be respectively, 3·33 and 4·79 log, 2·25 and 4·0 log, 2·0 and 3·7 log, and 0 and 2·0 log. Finally, 5 volunteers were inoculated with this dried UV vaccine after 12 months' storage at 18–25°C.: immunization was effected in 3 courses, each of 3 days, at intervals of 3 days; the first injection was given in a dose of 1 ml. and each subsequent injection in a dose of 3 ml. of resuspended vaccine. The immunogenicity of the vaccine was assessed from the degree of neutralization of the homologous virus by the serum of the inoculated persons. By the 15th day after the beginning of the inoculations, formation of antibodies in high titres was observed, the neutralization indices varying from 1,000 to 67,610; on the 30th day the maximum titre was reached, with neutralization indices from 67,610 to 100,000—a titre which remained constant to the 60th day, when observations were discontinued. It thus appears that inactivation of rabies virus with ultra-violet light permits the preparation of a highly immunogenic dried rabies vaccine, which can be stored for a prolonged period. *G. Stuart*

PLAGUE

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, rodent hosts, transmission, pathology, diagnosis, clinical findings, treatment, control.

Bull. World Health Organization. Geneva. 1960, v. 23, Nos. 2/3, 135–418, illustrated. [Numerous refs.] **Plague.**

This volume contains a series of important papers on the epidemiology of plague, contributed by countries in which the disease persists as an enzootic. A short introduction reviews their main features.

Recherches sur la Peste en Iran is discussed by M. Baltazard, M. Bahmanyar, P. Mostachfi, M. Eftekhari and C. Mofidi (pp. 141–155). Re-examination of the resistant rodent reservoir host of plague in Iran with new techniques revealed that it comprised 4 species of which 2 (*Meriones libycus* and *M. persicus*) were highly resistant and the other two (*M. vinogradovi* and *M. tristrami*) were very susceptible. The susceptible species are killed off in epidemics and the infected fleas, living on resistant rodents, infect men in the field. Transmission between men was by *Pulex irritans*, and since this flea feeds but does not live on man, evacuation from houses controls the epidemic.

M. Baltazard and B. Seydian contribute a paper on *Enquête sur les Conditions de la Peste au Moyen-Orient* (pp. 157–167). As in Iran, resistant and

susceptible species of wild rodent host (*Tatera indica* and *Nesokia indica* respectively) were found throughout the adjacent parts of Turkey, Syria and Iraq. The "Kurdo-Caspian" focus extends continuously from the Euphrates to the Caspian, and throughout the whole area *Pasteurella pestis* has specific characters. *P. irritans* was again incriminated as the vector between men.

Recherches sur la Peste en Inde, contributed by M. BALTAZARD and M. BAHMANYAR (pp. 169–215), reports a study of the mechanism of persistence and spread of plague in Uttar Pradesh. The disease moved continually through the area, though not necessarily along lines of communication. The main reservoir host is *T. indica*, which is resistant to plague and lives in dry, well-drained areas. In unfavourable periods the flea survives in deep burrows on the aestivating gerbils. In irrigated areas annual flooding eliminates plague. The wild host occasionally infects the domestic rat and after its death its fleas feed on man.

Recherches sur la Peste à Java is described by M. BALTAZARD and M. BAHMANYAR (pp. 217–246). Wild rodent plague involves *Rattus exulans ephippium* (resistant) and *Rattus rattus argentiventer* (susceptible), and it persists only in Central Indonesia where both are present. *R. exulans* cannot, however, sustain permanent plague foci and the infection moves continually, occasionally infecting the susceptible commensal *R. r. diardi* and involving man. Epidemics are small and rural and it is recommended that an eradication campaign should be substituted for the present costly control programme.

Déclin et Destin d'une Maladie infectieuse: la Peste by M. BALTAZARD (pp. 247–262) asks whether the present decline is cyclical or the disappearance of the pandemic initiated by the steamship. After implantation in the rural areas of certain countries, plague was maintained permanently by a local balance between susceptible and resistant rodents. He holds that epidemic plague occurs only when human ectoparasites are vectors; endemic plague occurs in wild rodent plague foci and is accidental; the term "anademic" plague is proposed for human infection resulting from the bites of rat fleas. The reservoir areas are an international responsibility, which can be attacked by residual insecticides and rodent elimination.

B. K. FENYUK (pp. 263–273) contributes a paper entitled *Experience in the Eradication of Enzootic Plague in the North-West Part of the Caspian Region of the U.S.S.R.* He holds that small-scale wild rodent destruction must be accompanied by disinsectization. In the Caspian region small campaigns were unsuccessful, and a large campaign of "complete clearing" over 7 million hectares was adopted. In 1947 zinc phosphide poison baiting was substituted for gassing and by 1955 eradication was achieved except in a small sector. The Transbaikalia focus also has been cleared of plague by elimination of the marmot. Present techniques, however, are complicated, laborious and costly.

Plague in Camels and its Prevention in the U.S.S.R. is contributed by V. N. FEDOROV (pp. 275–281). Natural infection occurs in camels, and man may be infected from them while slaughtering and preparing the carcass for consumption. Experimental transmissions were successful by means of blocked rodent fleas and sometimes by *Argas* ticks after interrupted feeds on an infected rodent. Plague in camels is unimportant in the U.S.S.R. but prophylaxis with dried live vaccine and residual insecticide is recommended.

S. C. SEAL contributes *Epidemiological Studies of Plague in India: 1. The Present Position* (pp. 283–292). A peak incidence of plague in various states

was reached between 1943 and 1950 and in 1956 enzootic plague appeared in Assam for the first time, probably introduced from Uttar Pradesh in bagged mustard seed. Rural plague predominates in India. The factors influencing seasonal incidence are discussed. Investigation showed vector fleas to be fully susceptible to DDT, BHC and malathion in normal dosage. The second part of this paper, *The Changing Pattern of Rodents and Fleas in Calcutta and Other Cities* (pp. 293–300), shows that since 1910 the relative prevalence of individual rat species has changed. In Bombay commensal rats have decreased in number while *Bandicota bengalensis* has increased greatly. Resistance of local rodent species to plague was found to vary according to previous experience of the disease. The general flea and *Xenopsylla cheopis* index has been low in Calcutta since 1948, and the predominant flea is *X. astia*. *Rattus rattus* and *X. cheopis* are important factors in human plague; control of either will eliminate the disease.

A Confirmed Case of DDT-Resistance in Xenopsylla cheopis in India is described by T. B. Patel, S. C. Bhatia and R. B. Deobhankar (pp. 301–312). The level of resistance was estimated in *X. cheopis* from two districts of Bombay State, Poona and North Satara. The technique of testing is described. Mortality of the fleas from Poona and Satara was 15% and 100% respectively when exposed to 4% DDT for an hour. Exposure to 16% DDT only raised to 24% the mortality of Poona fleas which are also 8 to 16 times more resistant to BHC and 2 to 3 times to dieldrin than the Satara strain.

R. Pollitzer in *A Review of Recent Literature on Plague* (pp. 313–400) brings his 1954 WHO monograph up to date by summarizing the recent literature and some references previously inaccessible. Subjects covered are bacteriology, immunology, pathology, practical laboratory work, hosts of infection, insect vectors, treatment, ecology and epidemiology, prevention and control. He provides 12 pages of references and 2 annexes listing the rodent hosts of plague and the rodent fleas found naturally infected.

A series of notes concludes the volume. B. N. Pastukhov describes *The Epizootic and Epidemic Situation in the Natural Foci of Plague in the U.S.S.R. and the Prophylactic Measures Taken* (pp. 401–404). He describes the Caspian, Central Asian, Transcaucasian and Transbaikalia foci and the control organization. D. H. S. Davis, B. W. Fisher and F. Goldring describe *The Luangwa Valley Plague Outbreaks and their Significance in Relation to Savannah Plague in Central Africa* (pp. 405–408). The focus is probably an old one which erupts when the reservoir host population is dense. *An Unusual Strain of Pasteurella pestis Isolated from a Fatal Human Case of Plague* is described by C. C. Winter, W. B. Cherry and M. D. Moody (pp. 408–409). A. W. A. Brown describes the *Present Extent of Insecticide-Resistance in Fleas* (p. 410). *Pulex* and dog- and cat-fleas are said to be resistant in various areas, but up to 1956 no resistance was reported in *X. cheopis* in the U.S.A. E. Schwarz discusses the *Classification, Origin and Distribution of Commensal Rats* (pp. 411–416). Five sections of the species of *R. rattus* are described and their distribution mapped. D. E. Davis discusses the *Role of Density in Populations of Mammalian Plague Reservoirs* (pp. 417–418). Experiments with rodents at different population densities showed that density affects reproduction and mortality, and thus the course of plague, through physiological mechanisms.

T. H. Davey

MESSIH, G. A., EL GHOROURY, A. A. A. & ABDOU, A. E. **Search for Plague Focus in Assiut, Egypt, U.A.R.** *J. Egyptian Pub. Health Ass.* 1960, v. 35, No. 1, 7–14, 1 fig. [11 refs.]

After the plague epidemic in Egypt in 1899 the disease disappeared except in Assiut and Girga, and since 1941 it has been absent from the whole of Assiut [this *Bulletin*, 1941, v. 38, 626]. It was decided to ascertain whether plague was entirely absent by collecting rodents from the city of Assiut, an adjacent village, and villages on the edge of the desert. The rats were live-trapped, identified, their ectoparasites collected, stained smears of the organs examined and pooled preparations of organs inoculated into guineapigs. A total of 408 rodents were caught. The commonest ectoparasite was the flea and of these the majority were *Xenopsylla cheopis*. The rodents comprised 263 *Rattus rattus*, 2 *R. norvegicus*, 64 *Acomis*, 56 *Gerbillus pyramidum*, 8 *G. gerbillus gerbillus*, 8 *Jaculus jaculus*, 5 *Mus musculus* and 2 *Meriones* sp. All smears and pooled preparations proved negative for *Pasteurella pestis*.

T. H. Davey

See also p. 145, TAUFFLIEB **[Notes on the Fleas of Equatorial Africa, especially in the Brazzaville Area]**.

BARNES, A. M. & KARTMAN, L. **Control of Plague Vectors on Diurnal Rodents in the Sierra Nevada of California by Use of Insecticide Bait-Boxes.** *J. Hygiene*. 1960, Sept., v. 58, No. 3, 347–55, 1 fig. [11 refs.]

This paper reports an investigation of the effect of insecticide bait-boxes [this *Bulletin*, 1959, v. 56, 610] in the control of fleas on two species of chipmunks and a species of ground-squirrel which are wild rodent hosts of plague in California. Live trapping on a grid was carried out in the area of the study and in an adjacent untreated area. The boxes were baited with 100 gm. rolled oats and at each end was spread a ridge of about 25 gm. of 10% DDT dust. The rodents caught were marked and released after their fleas had been collected. A total of 913 chipmunks and 544 ground-squirrels were captured, and it was noted that the predominant fleas on the former readily fed on man.

The boxes were put down near the traps and baited daily for 12 days and were then removed while trapping continued to a total of 5 weeks. Within 24 hours of exposure to the DDT bait-boxes, fleas on both rodent hosts were markedly reduced, on one genus from an index of 2·4 to between 0·7 and 0·3, and they remained at this level during the 12 days' exposure to the bait-boxes. After these had been removed the flea index increased to 1·2 and within a week to 2·4. Replacement of the boxes for 28 days again reduced the index to a low level which was maintained during the period of their use. A residual effect on chipmunk fleas continued for a total of 42 days as a result of transport of the insecticide on the pelt to the nest. Control by the insecticide bait-boxes extended at least 400 yards beyond the area treated. This form of control has a selective action on vectors and causes no public resentment as does elimination of the rodents. Vector control is more economical and in an epizootic it immediately reduces the hazard to man.

T. H. Davey

WEISS, D. W. **Enhanced Resistance of Mice to Infection with *Pasteurella pestis* following Vaccination with Fractions of Phenol-Killed Tubercle Bacilli.** [Correspondence.] *Nature*. 1960, June 25, v. 186, 1060–61.

When 1·0 mgm. amounts of a crude methanol-soluble extract of phenolized bacilli of the BCG strain were injected intraperitoneally into Swiss albino mice and 2 months later the mice were challeneged with 1×10^7 living organisms of the EV 76 strain of *Pasteurella pestis*, it was found that the mice receiving the extract, whether in saline or in incomplete Freund's adjuvant, were significantly more protected than the controls which received saline only.

A second experiment was performed by injecting different batches of mice with the residue of the methanol-soluble extract used in the first experiment, and living BCG, but as the challenge was somewhat larger and the interval between vaccination and challenge shorter the results are not comparable.

It should also be noted that *P. pestis* strain EV 76 is a relatively avirulent strain [this *Bulletin*, 1953, v. 50, 623] and avirulent or low virulence strains do not always give consistent results in mouse protection experiments.

H. J. Bensted

CHOLERA

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

ROSENBERG, C. **The Cause of Cholera: Aspects of Etiological Thought in Nineteenth Century America.** *Bull. History of Med.* 1960, July–Aug., v. 34, No. 4, 331–54. [Refs. in footnotes.]

FUHRMAN, Geraldine J. & FUHRMAN, F. A. **Inhibition of Active Sodium Transport by Cholera Toxin.** [Correspondence.] *Nature*. 1960, Oct. 1, v. 188, 71–2, 1 fig.

MIKHAILOV, I. F. & LI LI. **Detection of *Vibrio comma* on Objects of the External Environment by means of Fluorescent Antisera.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1959, v. 30, No. 8, 33–40, 1 fig. [11 refs.] [Translated from Russian.]

This paper is concerned with the application of the fluorescent antibody technique for the identification of cholera vibrios in artificially infected waters or in washings from artificially infected material such as grass, leaves, soil, etc. Additional experiments were done in which a polyvalent phage was introduced into part of the culture material being examined, and yet further experiments employed what is called the fluorescent microagglutination technique. The

authors appear to be satisfied that their experiments show that the application of the fluorescent antibody technique offers a quick diagnostic method for the routine identification of the cholera vibrio. *H. J. Bensted*

KRUATRACHUE, M., BURI, R., NA-NAKORN, S., PHANICH, V., SATHAPANAKUL, C. & TUCHINDA, C. **Fluid and Electrolyte Disturbances in Cholera before Treatment, and the Effect of Intravenous Administration of Various Saline Solutions: a Study of Ninety-Three Cases.** *Ann. Trop. Med. & Parasit.* 1960, Apr., v. 54, No. 1, 106–11. [12 refs.]

The authors observe that though there appears to be general acceptance of the desirability of administering alkaline solutions to patients suffering from severe cholera, there is no unanimity as to whether saline should be infused in normal or hypertonic concentration [this *Bulletin*, 1957, v. 54, 1187]. During the epidemic of 1958 in Bangkok they carried out a carefully planned investigation with a view to defining the electrolyte requirements in acute cholera, and their findings in 69 patients, whose ages ranged from 12 to 70 years, are here recorded.

69 patients, 24 males and 45 females, were subjected to investigation prior to venoclysis. The whole blood specific gravity was determined by the copper sulphate gravimetric method and the haematocrit was determined. The CO_2 combining power, the sodium and potassium and the chloride concentration of the serum were estimated.

The initial serum sodium concentration ranged from 112 to 168 mEq. per litre, with a median range of 135–145 mEq. per litre [a normal value]. That of serum potassium ranged from 1·9 to 6·5 mEq. per litre, with a median range of 2·9–3·9 mEq. per litre [the normal range being 3·5–5·5]. The chloride concentration ranged from 90–124 mEq. per litre, with a median value of 111–121 [the normal range being 97–107 mEq. per litre]. The CO_2 combining power in 14 patients ranged from 8–25 mEq. per litre, which showed that acidosis was present [normal range 24–31 mEq. per litre]. The whole blood specific gravity in most patients was high, 1·065 or over [normal 1·054]. This determination was used as a guide to the volume of infusion necessary, as follows: specific gravity 1·058–1·060, 500 ml.; 1·060–1·062, 1,000 ml.; above 1·062, 1,500 ml.

The concentration of sodium in the serum in this series of patients was high, being above the normal range in 30% and within it in 42·6%, likewise the chloride concentration was abnormally high in 54% and within the normal range in 31·3%. Conversely the potassium concentration was abnormally low in 75·6% of patients, and was abnormally high in only 1. These findings are at variance with previous reports from India, in which the usual findings have been low sodium and chloride concentrations, with no depletion of potassium [*ibid.*, 1941, v. 38, 583]. The authors point out the necessity of replacement of potassium in severe cholera.

The contrasting effects of infusion of normal saline, hypertonic saline and hypertonic saline plus sodium bicarbonate were observed in 57 patients, the second estimation in each case being carried out within 30 minutes of the completion of venoclysis, before further diarrhoea, vomiting or micturition had occurred. Each fluid lowered the blood specific gravity to the same degree, but the hypertonic saline solution, as compared with the normal saline

solution raised the serum sodium concentration [which already tended to be high], though only by 3–5 mEq. per litre. Neither improved the acidosis, though the addition of 8–16 gm. of sodium bicarbonate was effective in this respect.

The authors conclude that what counts in the replacement of fluid is not its concentration of sodium chloride so much as its volume: for both replacement and maintenance fluid normal saline is best. Potassium supplements should be added, by mouth if possible. Sodium bicarbonate supplements are often necessary. *J. H. Walters*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

SARMA, K. & NAMBIAR, K. C. **Spontaneous Intraperitoneal Rupture of an Amoebic Liver Abscess. Report of a Case.** *Postgraduate Med. J.* 1960, Oct., v. 36, No. 420, 629–30. [11 refs.]

PÈNE, P., STEWART, G. T., LINHARD, J. & MOULANIER, M. Traitement par le chlorhydroxyquinoléine d'affections intestinales, bactériennes et parasitaires. [**Treatment of Bacterial and Parasitic Intestinal Infections with Chlorhydroxyquinoline**] *Bull. Soc. Méd. Afrique Noire Langue Française.* Dakar. 1960, v. 5, No. 2, 141–4.

Chlorhydroxyquinoline is a mixture of 5-monochlor and 5–7 dichlor-hydroxyquinoline. The bacteriostatic activity of this substance against intestinal bacilli has already been demonstrated by HESELTINE and CAMPBELL in 1940 [no reference given]. When given by the mouth nearly all of it is eliminated in the faeces without being absorbed.

In 1959 the authors used this drug for the treatment of 56 patients with enterocolitis of varying degrees of severity of which dysentery was the most serious. The series comprised 33 women and 23 men—50 Africans and 6 Europeans.

In examination of the stools haematophagic *Entamoeba histolytica* was found in 8, cysts of amoebae in 6, cysts of *Trichomonas hominis* in 3, eggs of *Ancylostoma duodenale* in 7, those of *Ascaris* in 2, and of *Trichocephalus* in 2. On culture *Shigella flexneri* was found in 6, *ambigua* in 2, and *sonnei* in 1, *Aerobacter aerogenes* in 17, *Proteus vulgaris* in 15, *Escherichia coli* in 7, Paracolon bacilli in 6, pathogenic streptococci in 2 and *Pseudomonas pyocyanea* in 1.

The dosage was adapted to weight. Thus, 4 gm. in 4 doses of 4 tablets of 0·25 gm. was the dose for a man of 50 kgm. weight. Treatment lasted 7–15 days and was well tolerated.

The authors consider that the simple form of treatment is most effective in protozoal and bacterial infections, especially amoebic and bacillary dysentery as well as trichomoniasis. Helminthic infections are an exception and were unaffected. *Philip Manson-Bahr*

CANET, J. Traitement de l'amibiase intestinale chronique par un dérivé phénanthroline-quinonique: le 4,7 phénanthroline-5,6-quinone. [**Treatment of Chronic Intestinal Amoebiasis with Entobex**] *Bull. Soc. Path. Exot.* 1960, Mar.–Apr., v. 53, No. 2, 265–73. [15 refs.]

This is yet another record of treatment of amoebiasis with Entobex (Ciba 11925C). 20 European patients from France and from tropical countries with intestinal amoebiasis were the subjects; some of them had associated intestinal infections with worms and with other protozoa. The chief aim of the author was to determine the optimum dosage of the drug; from 28 to 72 tablets (each containing 50 mgm. of Entobex) were given over 7 to 10 days. The most effective dosage was 60 to 70 tablets over 8 to 10 days (6 to 8 tablets daily), but he considers that this could with profit be increased beyond the 10-day period. Side effects were slight in all but one patient who had to stop the drug after 4 days. The clinical results were good as judged by relief of symptoms; the 4 patients getting the 72 tablets all ceased to pass parasites in the stools [immediately after treatment]. *Entamoeba coli* infections appeared to be eradicated by Entobex treatment, but it did not seem to influence *Strongyloides* or *Giardia* infections. Short case histories are given. *A. R. D. Adams*

TRIPATHY, B. B. & KAR, B. C. **Chemotherapy of Amoebiasis with Compound 11925C (Entobex).** *Indian Practitioner.* 1960, Feb., v. 13, No. 2, 171–82, 3 figs. [17 refs.]

Difficulty in the treatment of *Entamoeba histolytica* infection is due in part to the variations in its response to drugs, according to the nature of the infection or to its location. Hepatic amoebiasis responds to drugs which do not influence the chronic intestinal form; the latter similarly differs in its drug responses from the acute intestinal infection. No single drug is effective against the infection in all sites.

Entobex (Ciba 11925C) (5-6 quinone 4-7 phenanthroline) was given orally to 100 patients with acute or with chronic intestinal amoebiasis, or with amoebic hepatitis; the patients were of all ages and of either sex and they were treated as out-patients. Entobex was given either alone (200–300 mgm. daily) or in doses of 60 to 150 mgm. daily together with Vioform (600 to 750 mgm. daily) usually for 8 days; the treatment was repeated when necessary for variable periods. Stools were examined on the 5th and 9th days after the start of treatment, and subsequently on at least 3 occasions over 3 to 6 months. Patients with acute or chronic intestinal amoebiasis treated with Entobex alone (in doses of at least 150 mgm. daily) were considered by the authors to benefit in a gratifying manner from the treatment, only a few so treated were known to relapse. Of 25 patients with amoebic hepatitis [clinically diagnosed and some of them febrile] 23 responded in a satisfactory manner to repeated treatments

with Entobex. The presumed cure rate in 60 patients with chronic intestinal amoebiasis treated with Entobex also was satisfactory (94·7% cure rate with the biggest dosage). *A. R. D. Adams*

SINGH, H. N. **The Treatment of Amoebiasis with Preparations 11925 and 11925C.** *Indian Practitioner.* 1958, May, v. 11, No. 5, 423–9.

"1. A clinical trial with Preparations 11925 and 11925C (Entobex) on 103 patients suffering from amoebiasis has been carried out and the results discussed.

"2. Preparation 11925 and Preparation 11925C (Entobex) have been tried in 41 and 38 cases of amoebic dysentery respectively.

"3. Preparation 11925C (Entobex) has been tried in 24 cases of amoebic hepatitis also.

"4. Following conclusions are drawn:

"(a) Preparation 11925C (Entobex) is a drug producing favourable therapeutic response. The results obtained with this product seem to be superior to those of Preparation 11925."

SINGH, H. N. **Preparation 11925C (Entobex) and Iodochlorhydroxyquinoline (Enterovioform) Combination in the Treatment of Amoebiasis.** *Indian Practitioner.* 1959, June, v. 12, No. 6, 497–506, 6 figs.

"1. Ninety cases of amoebiasis were treated with a combination of Preparation 11925C (Entobex) and iodochlorhydroxyquinoline (Enterovioform) in different concentrations.

"2. The three Schemes consisted of Scheme I (Entobex 100 mg. and Enterovioform 750 mg.), Scheme II (Entobex 150 mg. and Enterovioform 750 mg.), and Scheme III (Entobex 60 mg. and Enterovioform 600 mg.) in three divided doses.

"3. Combined treatment proved to be efficacious in controlling the different symptoms and signs of amoebiasis. The vegetative and cystic forms of Entamoeba histolytica disappeared from the stools of the patients in 55%, 80% and 42% of cases of Schemes I, II and III respectively.

"4. The combination of 150 mg. of Entobex with 750 mg. of Enterovioform (1:5 ratio) was superior to the other ones in combating the symptoms and signs.

"5. The side reactions were seen in eight cases and consisted of slight burning sensation in the epigastrium which disappeared soon by simultaneously administering an anticholinergic (Antrenyl)."

i. WOODRUFF, A. W. & BELL, S. **Clinical Trials with Entamide Furoate and Related Compounds. I. In Non-Tropical Environment.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, July, v. 54, No. 4, 389–95.

ii. MARSDEN, P. D. **II. In a Tropical Environment.** *Ibid.*, 396–9.

iii. BOYD, J. S. K. **The Significance of Cyst-Passers.** [Correspondence.] *Ibid.*, 406–7.

i. Having found that diloxanide (Entamide, Boots) sterilized the intestinal infections with *Entamoeba histolytica* of some patients passing cysts, but not of

those passing amoebae [this *Bulletin*, 1956, v. 53, 995], the authors sought modifications of the drug that might be more effective; those examined were the benzoate, the piperazine sulphate and the furoate derivatives. Diloxanide, though relatively insoluble in water, is in part absorbed from the gut. By using ^{14}C as a label, blood level determinations showed Entamide piperazine sulphate to be more freely absorbed from the intestine and Entamide furoate less so than diloxanide. *In vitro* testing on cultures of *E. histolytica* showed amoebicidal activity of all 3 compounds, that of the furoate being about 100 times that of either of the other two. The benzoate and the furoate were less toxic to laboratory animals than diloxanide, the parent substance. Entamide benzoate was given orally to 18 patients passing cysts, at a dosage of 40 mgm./kgm. body weight daily for 10 days. The faeces of 11 patients examined daily during treatment were cleared of cysts in an average of 3·6 days. 15 patients were examined on 1 to 8 occasions (average 3·6 times) for up to 12 months thereafter and parasites were recovered from only 2 of them.

Entamide piperazine sulphate was similarly given at a daily dosage of 30 mgm./kgm. body weight to 19 patients, 2 of whom had active dysentery. Of 16 of these patients examined similarly (average 2 times) 2 were not sterilized of their infections—one of these was a patient with active dysentery.

Entamide furoate was given at a daily dosage of 20 mgm./kgm. body weight for 10 days to yet another 35 patients, 3 of them with dysentery. Of 30 of these patients (2 of them being the dysenteric cases) re-examined (average 1·5 times) during periods of up to 9 months thereafter only one was found still to harbour the infection, and this was not one of those suffering from active dysentery.

None of the 3 drugs caused any demonstrable side effects or toxicity. Entamide furoate on this evidence is claimed to be outstandingly successful in eradicating intestinal amoebiasis in the latent stage, and its use for regular treatment of food-handlers is suggested.

ii. Marsden reports on the clinical trial in West Africa of the furoate and the piperazine sulphate salts of Entamide using emetine bismuth iodide [EBI] treatment as a control. 72 subjects were given the furoate, 58 the piperazine sulphate and 21 EBI; the dosage of the 2 former was 20 mgm./kgm. body weight daily for 10 days, and that of EBI 0·2 gm. similarly. On observation once a month for periods of up to 2 months 4 of 21 (19%) patients treated with EBI, 14 of 55 (25·4%) of those treated with the piperazine sulphate, and 7 of 71 (10%) with the furoate were found still to be infected. EBI caused nausea and the furoate flatulence, but the piperazine sulphate caused no side effects.

17 patients with acute amoebic dysentery were treated with the furoate; 3 of these were still passing parasites at the end of treatment; among the 16 re-examined once a month for 2 months another was found still to be infected; the failures therefore were 4 of 16 (25%).

There is also a record of the other protozoan and helminthic parasites found on the stool examinations of Nigerian patients.

iii. In comment Boyd remarks that a much more searching follow-up is necessary before the results claimed by Woodruff and Bell can be compared with those obtained with drugs of such established value as emetine and EBI. Several patients on whose examinations their claims are founded were re-examined only once; in such small series of cases this quite inadequate examination could very materially affect results. The routine search for and treatment of infected food-handlers to prevent the spread of amoebic dysenteric infection

in India, or in the Middle East, is quite impracticable; with the high incidence of infection in the general population re-infection in any event would quickly follow their effective sterilization. The incidence of amoebic dysentery among those with amoebiasis in general is low, even in India, and it is notoriously so in the United Kingdom. What precipitates virulence of the parasite is unknown, but treatment for eradication of the virulent infection is desirable; the mass treatment of asymptomatic infections is beyond practicality. *A. R. D. Adams*

DOONER, H. P. **The Treatment of Amebiasis with Paromomycin (Humatin).** *Antibiotic Med.* New York. 1960, Aug., v. 7, No. 8, 486–9.

Paromomycin has been shown to exert very effective amoebicidal action both *in vitro* and in experimental animal infections with *Entamoeba histolytica.* Its plasma concentration is of short duration and therefore repeated oral dosage is necessary to maintain it at an effective level; large dosage may cause tubular and glomerular renal necrosis, but this is made good if the drug is stopped.

32 Chilean adult patients with amoebic dysentery, chronic and not severe but in some cases of long duration, were treated orally with 5 capsules each containing 250 mgm. of paromomycin (about 20 mgm./kgm.) daily for 5 days (total 6,250 mgm.). All were subsequently observed one month later, and some of them at monthly periods up to the 12th month. The only side effects they suffered from the treatment were slight diarrhoea and abdominal pains in about one-third of those given the drug.

There was symptomatic relief by the second day of treatment in all patients; no parasites were found in the stools of any of the patients on re-examination after one month; and of those who attended for subsequent re-examinations all continued parasite negative to stool examination.

For comparison there are records of the results of treatment of similar patients with the tetracycline antibiotics, or erythromycin, with or without other drugs. Paromomycin treatment gave an apparent 100% cure rate and this was equalled by treatment with oxytetracycline together with iodochlorhydroxyquinoline and glycobiarsol (12 patients) at the end of the 3rd month of observation. Treatment with tetracycline, or erythromycin, with or without adjuvants, gave lower rates of cure. *A. R. D. Adams*

HEGEMANN, M. **Experiences with Neoviasept in the Management of Amebiasis.** *Indian Practitioner.* 1958, Sept., v. 11, No. 9, 849–50.

The author treated 52 patients with amoebiasis (28 chronic and 24 acute) with Neoviasept (Hoechst) which is a combination of 250 mgm. bismuth glycolylarsanilate and 75 mgm. chloroquine diphosphate [presumably per dragée]. It is not stated whether the cases were confirmed parasitologically. Each patient received 2 dragées thrice daily for 8 days.

All those with acute disease were " completely cured " and all but 6 of those with chronic disease: these 6 improved notably. The stools " returned to normal " [? parasitologically], the weight, symptoms and general health improved. 12 patients had had liver involvement and this disappeared in all after treatment.

Recurrence of symptoms occurred " some weeks or months " in only isolated instances [numbers not given]. Symptoms disappeared in these after a second course of Neoviasept and they have been free for more than 6 months. No side effects were noted.

Two illustrative examples are given in which symptoms disappeared quickly in patients who had been treated unsuccessfully elsewhere for 1 and 3 years respectively and these patients have not relapsed in 5 to 9 months.

[More detailed data would have added to the value of this paper.]

H. J. O'D. Burke-Gaffney

ABD-EL-GHAFFAR, Y. **Successful Treatment of Hepatic and Splenic Amebic Abscesses with Atabrine after Failure of Emetine, Chloroquine and Terramycin.** *J. Egyptian Med. Ass.* 1960, v. 43, Nos. 1/2, 61–5.

The author records the history of 3 patients with amoebic abscesses, 1 splenic and 2 hepatic, which resolved under mepacrine treatment.

[In none of these cases is there confirmation of the diagnosis by identification of an *Entamoeba histolytica* infection.]

[See also this *Bulletin*, 1955, v. 52, 639.] *A. R. D. Adams*

PRUSS, J. Das natürliche Vorkommen von *Entamoeba muris* und die Übertragungsmöglichkeit auf Versuchstiere. **[Natural Incidence of *Entamoeba muris* and Attempts to Transmit it to Experimental Animals]** *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1960, v. 11, No. 2, 190–206, 10 figs. [Numerous refs.]

The English summary appended to the paper is as follows:—

" A survey of the occurrence of *Entamoeba muris* showed natural infections of 23.15% with Norway rats (*Rattus norvegicus*), 19.91% with laboratory rats, and 55% with laboratory mice. 66.25% of the examined Syrian hamsters (*Mesocricetus auratus*) harboured amoebas resembling *E. muris*. The grade of infection in a single test animal was very low, with the exception of Syrian hamsters weighing more than 80 gms.

" The grade of infection in laboratory rats having been experimentally infected with *E. muris* from the caeca of spontaneously infected rodents was generally lower than in the natural carriers of the infection. An attempt to increase the grade of infection by passage transfer *in vivo, i.e.* inoculating the caecal contents of one laboratory rat into another, did not yield satisfying results."

JARPA, A., MONTERO, E., NAVARRO, C., MAYERHOLZ, M., VASQUEZ, A. & ZULOAGA, Marta. Isosporosis humana. **[Human Isosporosis]** *Bol. Chileno de Parasit.* 1960, July–Sept., v. 15, No. 3, 50–54, 1 graph. [11 refs.]

The English summary appended to the paper is as follows:—

" The authors report 189 cases of *Isospora belli* infections among 5,763 individuals. Diagnosis was made by concentration technics (modified Telemann

procedure) in serial stool examinations. Isosporosis has been found a rather frequent infection in Santiago, mainly from November through July.

"Symptomatology and hematological and X ray findings are commented upon.

"The authors emphasize the onset (generally with fever), the acute or subacute diarrhea with marked asthenia, anorexia and loss of weight, high eosinophilia, and resistance to treatments commonly used in diarrheas of different etiology.

"The finding of Charcot-Leyden crystals in stools is pointed out."

LARIVIÈRE, M., HOCQUET, P., LAPIERRE, J. & CAMERLYNCK, P. Présence de *Balantidium coli* chez les porcs d'un village de Sérère: découverte d'un cas humain. **[Presence of *Balantidium coli* in Pigs in a Sérère Village in Senegal and Discovery of a Human Case]** *Bull. Soc. Méd. Afrique Noire Langue Française*. Dakar. 1960, v. 5, No. 2, 176–9. [12 refs.]

The senior author with other colleagues has already reported a fatal case of balantidial dysentery in Senegal [this *Bulletin*, 1958, v. 55, 1014]. He now reports another case in a village 75 km. from Dakar in a boy who was one of 195 examined in the course of a survey for schistosomiasis; the boy harboured 3 other intestinal parasites. The balantidia were readily identified and measured 100–110 μ × 82–88 μ. They were found in 3 consecutive stool examinations in one week. 30 of 35 local pigs were shown to harbour the balantidium.

The authors discuss the epidemiology and treatment in the light of the literature. The patient, together with others, was treated for his schistosome infection with 6171 RP [*ibid.*, 1960, v. 57, 49] and the balantidia disappeared and were still absent after 109 days; but the authors do not claim that this was due to the drug used. *H. J. O'D. Burke-Gaffney*

RELAPSING FEVER AND OTHER SPIROCHAETOSES

SKRYNNIK, A. N. **[The Habitats and Infection with Spirochaetes of the Tick *Ornithodoros nereensis* Pavl.]** *Dokl. Akad. Nauk SSSR*. Moscow. 1959, v. 127, No. 1, 230–32, 2 figs. [In Russian.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1960, Aug., v. 48, Pt. 8, 142–3.]

"*Ornithodoros nereensis* Pavl. was found in the Karakala region of Turkmenia in 1931 and shown to be able to transmit relapsing-fever spirochaetes; it is known from no other region. In 1951, the author and co-workers collected some 5,000 ticks, both Ixodids and Argasids, there. They included 466 examples of *O. nereensis*, from nine burrows inhabited by tortoises and rodents, and some of these ticks proved to be infected with spirochaetes. In the laboratory, the ticks lived for up to five years. They could not be infected with spirochaetes derived from *O. tholozani* (Lab. & Mégn.) (*papillipes* Bir.), and seven other species of *Ornithodoros* could not be infected with spirochaetes

from *O. nereensis*, although *O. nereensis* itself was readily infected with them and transmitted them. This suggested that the spirochaetes were specific to *O. nereensis*, and O. V. Smirnov named them *Borrelia* (*Spirochaeta*) *nereensis* in 1958.

" In the autumn of 1958, the author carried out investigations near the village of Nere, not far from Karakala, and found ticks of the genus *Ornithodoros* in 53 of 260 burrows. There was a shallow rocky ravine near the village, with houses on one side of it and damp ground and some standing water at the bottom. Burrows inhabited by tortoises were common on the sides of the ravine, and 842 examples of *O. tartakovskyi* Olen. were taken in 24 of these, some of them attached to the necks of the tortoises. *O. nereensis* was found only twice in burrows of the usual type on the sides of the ravine, but was common in cracks in damp soil beneath very large stones, where woodlice, which are not known to be associated with any other Argasids, also occurred, and all stages were found in 27 burrows beneath similar stones. Toads (*Bufo viridis*) were present in 11 of these burrows, 2–3 sometimes occurring in a single one, and most of the ticks in them were found in the neighbourhood of the toads; lizards were frequently seen outside on the stones. The ecology of *O. nereensis* thus resembles that of *O. alactagalis* Isaakyan, which was first found in numbers in 1951 by the author and N. A. Filippova in burrows inhabited by the same toad on the sides of a ravine with a damp bottom in Azerbaijan, the two species are also similar morphologically. The numbers of *O. nereensis* per burrow varied from one to 400, and 2,826 nymphs and adults of both sexes were collected in all. No other Argasid was found, but Ixodids of two genera were occasionally present. *O. nereensis* sometimes attached itself to the arm while the burrows were being investigated, but the attack was less active than in the case of some other species of the genus.

" The observations in the ravine indicated that species of *Ornithodoros* are closely adapted to special habitats. Within a distance of less than a kilometre, *O. nereensis* was found in burrows beneath stones, *O. tartakovskyi* in the burrows of tortoises, and *O. tholozani* in a single small cave at the bottom. The ticks could easily be transported from one habitat to another while attached to their animal hosts, but their distribution is evidently limited by microclimatic requirements and host habits.

" In feeding tests with the ticks, 271 individuals of *O. nereensis* infected 6 of 9 white mice with spirochaetes, and 385 infected 5 of 6 hamsters (*Cricetus* (*Mesocricetus*) *auratus*), but guineapigs and toads (*B. bufo*) did not become infected. Feeding was completed in 1–1½ hours on all animals except the toads. The ticks remained on the latter for up to six days, and had to be collected from them on engorgement, since the toads ate any that they found crawling in the cage; this should be considered in any estimate of the part played by toads in the circulation of the spirochaetes in nature. The disease caused in the hamsters was severe. It lasted for about a month in both hamsters and mice, but more spirochaetes were observed in the blood of the hamsters, and one of the five that became infected died."

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

LEIKER, D. L. **Leprosy in the Netherlands.** *Leprosy Review.* 1960, Oct., v. 31, No. 4, 290–94.

There are 264 leprosy patients known in the Netherlands, and it is calculated that there may be up to 350 in all. Of the 264, practically all were infected abroad, and 157 are Indo-Europeans. 238 were infected in Indonesia, while 22 were infected in the West Indies. In the Indo-European group the male sex rate is 66% compared with 75% in the Europeans and 80% in the Indonesians. Among 28 family groups there are 70 leprosy patients, showing the importance of examining contacts. [As in England] segregation is not compulsory in the Netherlands. Except in 75 patients, symptoms of leprosy were noticed before arrival in the Netherlands. There was a particularly high influx of patients after the granting of independence to Indonesia, and again after anti-Netherlands activities in 1958. It is not known to what extent there is danger of Netherlands nationals being infected in New Guinea where there has recently been an increase of Europeans.

There is a 40-bed sanatorium, and there are arrangements for free dispensary treatment. The chance of infection of indigenous inhabitants is considered to be small. *Ernest Muir*

UTKU, S. La lèpre et la lutte anti-lépreuse en Turquie. [**Leprosy and the Anti-Leprosy Campaign in Turkey**] *Türk Ijiyen ve Tecrübî Biyoloji Dergisi.* Ankara. 1960, v. 20, No. 1, 147–51. [Fuller version in Turkish 139–45.]

The campaign against leprosy began in 1922 with a hospital of 250 beds in Elazig for the compulsory isolation of patients. Since the formation recently of the Turkish Association of Leprology it has been realized that such methods are out of date.

There are various estimations of the amount of leprosy in Turkey, but the author calculates an absolute minimum of 13,800, or 50 cases per 10,000; but the maximum of 25,000 is possible. The endemic areas are in the east and south-east, and in some central and northern areas of Asia Minor. The proposed campaign is listed under 9 headings: a plan accepted by Government; legislation along modern lines; the establishment of dispensaries, which has already begun in the provinces of Kars, Agri and Van, and other institutions; leprosy surveys and collection of statistics with the hope of help from the World Health Organization; a research and teaching institute with 30 beds in the neighbourhood of Ankara; dispensaries for treatment in all the endemic areas; sanatoria and leprosy villages; à preventorium for each 3 endemic provinces; the necessary medical and paramedical personnel. It is hoped, with the necessary help, to have all the above organized within the next 5 years, and that the object of the campaign will be accomplished within 10 to 15 years thereafter. *Ernest Muir*

LEIKER, D. L. **Epidemiological and Immunological Surveys in Netherlands New Guinea.** *Leprosy Review.* 1960, Oct., v. 31, No. 4, 241–59, 1 map.

A survey, begun in 1952 and extended over 5 years, makes it possible to draw a fairly accurate picture of leprosy in Netherlands New Guinea. It was possible to trace the origin of the disease in a group of islands, its spread to other islands and then to the coast of New Guinea mainland. Later, following on pacification, leprosy spread to the interior owing to increased contact between the more sophisticated coastal people and the backward tribes of the interior.

It is noted that, when leprosy was first introduced in an area with a low tuberculin index, it spread rapidly, producing a high leprosy index with a low type (lepromatous) index; in other words the great majority of the cases were of the tuberculoid type. Later, when leprosy had remained endemic for some years, there was a tendency for the leprosy index to fall and the type index to rise. It is suggested that the reason for this is that in people who have a potential immunity against leprosy, contact with tuberculosis produces an effective immunity, which prevents the development of tuberculoid leprosy symptoms; it is considered unlikely, however, that tuberculosis contact gives protection against leprosy in those who do not have a sufficient potential immunity.

"Therefore, although BCG vaccination does not guarantee individual protection against leprosy, it seems to be of definite value, especially in highly susceptible communities."

[This paper is the result of prolonged careful work and will repay study of the original.] *Ernest Muir*

DE SOUZA-ARAUJO, H. C. **Experiments in Immunology of Leprosy by means of Inoculation of Patients with Living and Dead Suspensions of Acid-Fast Bacilli Cultures.** [Paper sent to VII International Congress of Leprology, Tokyo, Nov. 12–19, 1958.] pp. 34–63, 5 pls. [Portuguese version 3–33.] 1959. Rio de Janeiro: Departmento de Imprensa Nacional, Brazil.

The author inoculated into 30 leprosy patients various suspensions of acid-fast bacilli, living and dead. Among these were cultures derived from human leprous lesions, Stefansky bacillus, and the tubercle bacillus. In 24 of these patients there was a general reaction with fever, etc., and "the leprolin skin-test produced craters in 10 patients, evidently due to the concomitant action of one of the three living inocula". The results obtained in 12 of the patients are described in detail.

It is concluded that the positivity of the Mitsuda test with "human and Stefansky lepromins" during leprosy reactions, or in patients with menacing lepra reaction, is false; the Mitsuda test with Stefansky lepromin is always strongly positive and has no value for classifying leprosy, but it seems to have some immunizing action; "the histopathology of residual lesions of Stefansky and Rhesus lepromin tests proved to be a tuberculoid granuloma, similar to that produced by the classical Mitsuda test"; L-2 and L-3 cases of leprosy inoculated repeatedly with acid-fast bacilli from leprosy patients gave a better

prognosis than those treated with sulphone alone. [This last statement is, however, not backed by controls.] *Ernest Muir*

PFALTZGRAFF, R. E. **Factors associated with Reactional States in Leprosy with special reference to Malaria.** *Leprosy Review.* 1960, Oct., v. 31, No. 4, 283–5.

The author noticed during a period of 8 years' observation in Nigeria, beginning in 1951, that lepra reaction was associated with accompanying diseases such as measles and chickenpox. He noticed particularly that reactions were frequent during the malaria season in July, August and September. However, in the years 1955, 1956 and 1957, when pyrimethamine (Daraprim) was administered to the leprosy patients, the incidence of lepra reaction was much less, as is shown in tabular form. The author attributes the fewer reactions to malarial suppression with pyrimethamine. [No mention is made of the findings of other workers that antimalarial drugs may have a *direct* action in suppressing lepra reaction, see JOB, this *Bulletin*, 1960, v. 57, 1178]. *Ernest Muir*

COT LESMES, V. Tratamiento continuo y prolongado de la lepra por las sulfonas. [**Continuous and Prolonged Treatment of Leprosy with the Sulphones**] *Bol. Soc. Cubana de Dermat. y Sifil.* 1960, Mar., v. 17, No. 1, 62–6.

The object of this experiment was to test the toxicity of sulphones and to find out in what dosage they are tolerated over a prolonged period of years. It was found that 14 patients, with all types of the disease, were able to continue with a daily dose of 1·80 gm. of Diasone for periods of 7 to 9 years continuously and without any signs of toxicity or intolerance. [No mention is made of the progress made by the patients under this treatment.] *Ernest Muir*

SCHNEIDER, J., LANGUILLON, J., CLARY, J., BOISSAN, R. & PICARD, P. Traitement de la lèpre par la sulfaméthopyrazine employée par voie orale et sous forme de suspensions injectables (2e note). [**Treatment of Leprosy with Sulphamethopyrazine used Orally and in the Form of Injectable Suspension**] *Bull. Soc. Path. Exot.* 1960, Mar.–Apr., v. 53, No. 2, 173–9, 2 figs. on 2 pls.

This drug [this *Bulletin*, 1959, v. 56, 1146] was tried on 10 leprosy patients, 6 of whom suffered from the tuberculoid form of the disease, and 4 from the lepromatous. The dose given orally was 750 mgm. every 48 hours. Within 11 months the results were most favourable, especially in the tuberculoid cases. Later 51 new patients were put on the same treatment, 24 of them being tuberculoid. Out of the latter, after over 6 months' treatment, 7 have entirely recovered. All the others have shown improvement except one child who in spite of receiving 127 gm. has not shown any improvement.

The improvement in the 19 new lepromatous patients, though definite, is not as striking during the 10 to 13 months' treatment as in the tuberculoid cases.

With a view to mass treatment the authors endeavoured to find a suspension which, injected once in 2 weeks would maintain a suitable blood concentration during that period. They found that it was better to use the acetyl derivative—acetyl-sulphamethopyrazine. By using a 23% suspension of this, and injecting 4 gm. of the drug, the authors found it possible to maintain a constant concentration of 20 to 25 mgm. per litre by means of fortnightly intramuscular injections.

10 patients were treated by this method, 5 of them tuberculoid. One was completely healed within 8½ months and the others have definitely improved. Of 4 lepromatous patients 2 are much improved and 2 less so, the nasal mucosa becoming negative in a few months.

When injections of sulphamethopyrazine were given instead of the acetyl derivative, the results, though definite, were inferior to those with the latter.

It is concluded that sulphamethopyrazine is definitely active in the treatment of leprosy; that it is well tolerated when given orally; that it is more effective in tuberculoid than in lepromatous leprosy, and is, in the author's opinion, the most effective drug yet known for the treatment of that type of leprosy. When it is given orally 750 mgm. should be given every 48 hours, but for mass treatment the authors are seeking to produce a satisfactory aqueous suspension so as to maintain with each injection the right blood concentration for a fortnight; for this the acetyl derivative seems most suitable. *Ernest Muir*

UTKU, E. Essai de la chimiothérapie de la lèpre avec SU 1906 Ciba et ses premiers resultats. **[Trial of SU 1906 Ciba in the Chemotherapy of Leprosy and the First Results]** *Türk Ijiyen ve Tecrübî Biyoloji Dergisi.* Ankara. 1960, v. 20, No. 1, 163–6. [Fuller version in Turkish 153–62.]

The trial was made on 21 patients (11 lepromatous, 2 indeterminate and 8 tuberculoid). There were favourable results in the lepromatous patients, both clinical and bacteriological, within 6 months; the results with the indeterminate patients were not so favourable after a year; the tuberculoid patients began to improve within 2 to 5 months, but were not entirely better at the end of a year, though the results were better than with the indeterminate type.

It is considered that the results are similar to those with the sulphones, that the effects on the general health of the patient are inferior to those with isoniazid, but that the toxic effects are less than those of DDS and isoniazid. Probably the best treatment at present is a combination of these three drugs. *Ernest Muir*

ROSS, C. M., TELFER, J. F. & HILTON, D. D. **An Account of the Use of Etisul in the Treatment of Leprosy in the Northern Region of Nigeria.** *Leprosy Review.* 1960, Oct., v. 31, No. 4, 260–64.

This is a report of the results after treatment with Etisul of 38 in-patients and out-patients in Northern Nigeria. The drug was supplied in unit dose tubes containing 5 gm. of diethyl dithiol*iso*phthalate in a suitable cream for percutaneous use. The patients were divided into 3 groups who were given inunction twice weekly, thrice weekly and daily. The thrice weekly method was considered the best as it gave the patient an interval in which to get rid of the

unpleasant smell. One group after 7 months' treatment showed an improvement of average bacteriological index from 1·6 to 0·6; another in 8 months from 2·0 to 0·8; and the third in 6 months from 3·5 to 0·8.

Morphological changes were found in skin smears after 3 or 4 months of treatment. Patients became negative who previously had had 2 or 3 years of DDS treatment and yet gave persistently positive smears. There were also patients whose peripheral nerve lesions showed resolution, with improvement in the state of hands and feet.

This form of treatment was popular and it was easy to get patients to cooperate. *Ernest Muir*

LECHAT, M. F. **The Use of "Etisul" (Diethyl-Dithiolisophthalate) in the Treatment of Leprosy in Africans.** *Leprosy Review*. 1960, Oct., v. 31, No. 4, 265–74. [Translation from *Ann. Soc. Belge de Méd. Trop.* 1959, v. 39, No. 6, 865–76.]

See this *Bulletin*, 1960, v. 57, 816.

MUKERJEE, N. & GHOSH, S. **Preliminary Trial of Etisul in the Treatment of Leprosy.** *Leprosy Review*. 1960, Oct., v. 31, No. 4, 275–7.

3 patients with lepromatous leprosy, previously untreated, were given 6 months' treatment with Etisul inunction. At first 2·5 gm. applied to the right arm and forearm produced papular lesions; later, inunction was made over a large area in addition to the arm.

There was no improvement in any of the patients; lesions became more extensive and the bacteriological index increased. *Ernest Muir*

THANGARAJ, R. H. & THANGARAJ, Sarojini. **Treatment of Acute Leprotic Neuritis with Hyalase and Cortisone.** *Leprosy Review*. 1960, Oct., v. 31, No. 4, 295–9.

40 leprosy patients suffering from recurrent acute leprotic neuritis were divided into 4 groups by drawing lots.

Group A had 1,000 units of Hyalase dissolved in 1 ml. of 1% Lignocaine injected intraneurally, this being repeated 4 days later.

Group B had intraneural injection of 0·5 ml. of cortisone acetate with 1,000 units of Hyalase in 1 ml. of 1% Lignocaine, repeated after 4 days.

Group C had only 1 ml. Lignocaine, acting as a control group.

Group D was given 1% intravenous potassium antimony tartrate 0·02 gm. rising to 0·05, on alternate days, with distilled water injected subcutaneously over the affected nerve. Groups A, B and C were given placebo intravenous injections.

There was complete relief in 6 patients in Group A, 8 in B, 5 in C and 6 in D, and partial relief in 2 in A, 1 in B, 1 in C and 2 in D. The best results were with Group B in which one patient had complete recovery of the radial nerve.

In this group a patient developed foot drop immediately after the injection into the lateral popliteal nerve. For the last 2 years Group B treatment has been adopted for all cases of leprous neuritis, but the results with hydrocortisone may be better. *Ernest Muir*

HELMINTHIASIS

In this section abstracts are arranged as far as possible in the following order:—TREMATODES (*schistosomes, other flukes*); CESTODES (*Diphyllobothrium, Taenia, Echinococcus, other cestodes*); NEMATODES (*hookworms, Ascaris, filarial worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.*).

RICCI, M. & GAGLIANO, E. Note sull'azione antielmintica della ditiazanina. [**Notes on the Anthelmintic Action of Dithiazanine**] *Riv. di Parassit.* Rome. 1960, June, v. 21, No. 2, 151–4. English summary (5 lines).

The authors have given dithiazanine to 81 children, each of whom was infected with 2 or more species of helminths, namely, *Hymenolepis nana*, *Ascaris lumbricoides*, *Enterobius vermicularis* and *Trichuris trichiura*. On the whole, they followed the dosage recommended by the makers—200 mgm. initially and 400 mgm. daily for the next 4 days, for a body weight of up to 21 kgm. Some children showed persistent vomiting and in some cases there was abdominal pain and loose bowels, but the rest seemed to tolerate the drug reasonably well.

The treatment proved efficient in the cure of enterobiasis, but it showed no advantage over such other anthelmintics as piperazine against ascariasis. The drug has no useful effect on *H. nana*, but it produced a considerable reduction of, though it did not cure, infection with *Trichuris*; and more effective remedies against this helminth are not yet available. *J. Cauchi*

FEBLES, F., Jr., BROOKE, M. M., JANOWSKY, C. C. & PERRI, A. M. **Out-Patient Tolerance and Anthelminthic Activity of New Formulations of Dithiazanine.** *Amer. J. Trop. Med. & Hyg.* 1960, July, v. 9, No. 4, 415–18. [17 refs.]

Parasitological surveys of Puerto Ricans in Philadelphia have revealed approximately 70% to be infected with *Trichuris trichiura*, 20% with hookworm and 4% with *Ascaris lumbricoides* [this *Bulletin*, 1960, v. 57, 535]. Dithiazanine was selected for routine use for nematode infections in view of its broad spectrum anthelmintic activity. It was found that several patients experienced side effects.

The present paper presents a report with 3 new formulations in comparison with the standard commercial product and a placebo. The new formulations were in the form of enteric-coated tablets containing the same quantity of dithiazanine, but differing in the approximate lengths of their disintegration times in intestinal fluid. The coatings (cellulose phthalate) were identical and enabled them to remain intact in simulated gastric juice after several hours. The core of the commercial tablet was composed of dithiazanine and starch, while the formulations II and IV contained methylcellulose and III contained polyvinyl pyrrolidone. Nos. IV and II differed in the size of the granules.

The same dosage and course of therapy were used for each dithiazanine product. They were given 3 times daily for 5 consecutive days according to the weights of the patients. The total daily doses varied from 200 to 600 mgm.

The anthelmintic effect of the new formulations was observed to be equal to that of the present commercial product as measured against infections with *T. trichiura*, but not enough infections with *A. lumbricoides*, *A. duodenale* or *Strongyloides stercoralis* were available for assessment.

New formulations with disintegration times longer than those of the present commercial product were found to be significantly better tolerated. That with the longest disintegration time (60–90 minutes) was tolerated almost as well as the placebo. The prevalence and types of side reactions are tabulated.

Philip Manson-Bahr

SOTOLONGO, F. La tolerancia a la ditiazanina. Estudio sobre 221 casos. [**Tolerance to Dithiazanine. Study of 221 Cases**] *Archivos Hospital Universitario*. 1960, Jan.–Feb., v. 12, No. 1, 1–36. [19 refs.] English summary (4 lines).

The author, from the Department of Parasitology and Tropical Diseases in Havana, Cuba, reviews at very considerable length the literature on dithiazanine, with special reference to the evidence for intolerance to this drug.

He then describes a study to assess the incidence of intolerance and of means to prevent it. The study was made on 221 patients treated with this drug. The dosage per lb. of body weight varied considerably, but the best tolerance was obtained with a dosage between 3·5 and 4·4 mgm. per lb. The daily dose never exceeded 600 mgm.

The results are analysed in a wealth of detail in respect of age, weight, total and daily dosage, duration and side effects. Intolerance in practice largely connotes nausea and vomiting, since other side effects were comparatively insignificant. The results are shown in 21 very detailed tables.

The patients were divided into 6 groups and received the following treatments:

A (31 patients)—dithiazanine only in enteric-coated tablets;
B (29 patients)—antispasmodic drugs and an aluminium hydroxide gel before meals and dithiazanine in enteric-coated tablets after meals;
C (45 patients)—dithiazanine and Chlorotin, an anti-emetic (25 mgm.), in the same enteric-coated tablet;
D (21 patients)—dithiazanine and Chlorotin, without the enteric-coated tablet;
E (18 patients)—dithiazanine in doubly-coated tablets;
F (77 patients)—dithiazanine, Chlorotin and lipotropic substances.

It was found that tolerance was better by administration after meals. Tolerance was classified as good, bad or very bad, on the arbitrary criteria of whether there was no (or a single) instance of vomiting; more than one attack of vomiting not requiring suspension of the treatment; or severe vomiting or other side effects requiring suspension of treatment.

Side effects were absent in the 6 groups respectively in 38·7%, 31%, 57·7% 33·3%, 44·4% and 74%. Enteric-coated tablets reduced the emetic effects, but did not abolish them, even when the tablets were doubly coated. The author considers that the drug has probably both a central and a peripheral action. Antispasmodic agents and protective substances such as aluminium hydroxide had little effect on vomiting.

The most striking result was the protective action of Chlorotin against the emetic action of dithiazanine. This increased the "good tolerance" to 91%. The addition of lipotropic factors seemed to enhance this good effect and brought the figure for "good tolerance" to 96%.

H. J. O'D. Burke-Gaffney

LARIVIÈRE, M., LAPIERRE, J., HOCQUET, P. & CAMERLYNCK, P. Étude d'un foyer de bilharziose à *S. mansoni* dans un village du cercle de Thiès (Sénégal). [**Study of a Focus of** *Schistosoma mansoni* **Infection in a Village in the Thiès Area, Senegal**] *Bull. Soc. Méd. Afrique Noire Langue Française*. Dakar. 1960, v. 5, No. 2, 88–94.

Foci of *Schistosoma mansoni* infection in Senegal were identified in Casamance [this *Bulletin*, 1952, v. 49, 776] and a focus in Sine Saloum [*ibid.*, 1959, v. 56, 58]. This paper reports the discovery of another focus. This is the village of Fandène, close to the town of Thiès and some 75 km. from Dakar. Children, 100 boys and 95 girls, up to the age of 12 years were clinically examined and specimens of urine, stool and thick films were examined by microscope on a single occasion. No blood parasites were found and no *S. haematobium* ova were seen in the urines. Intestinal parasites were present in 145 children, among whom 53 boys and 39 girls (47%) showed *S. mansoni* ova in the faeces. Infection first appeared at the age of 4 or 5 years when the children began to bathe in the stream. Enlargement of liver or spleen was as common in children not infected with *S. mansoni* as in those infected. Examination of the faeces of 10 pigs in this non-Muslim village revealed lateral-spined ova in 6. *Biomphalaria pfeifferi*, some of them shedding furcocercous cercariae, were collected from the stream and also specimens of *Bulinus* which were too young for specific identification. *T. H. Davey*

PITCHFORD, R. J. & VJSSER, P. S. **Some Observations on** *Schistosoma mansoni* **in Rodents in the Transvaal.** *Ann. Trop. Med. & Parasit.* 1960, June, v. 54, No. 2, 247–9, 1 fig. & 1 pl.

Ova similar to *Schistosoma mansoni* var. *rodentorum* described by SCHWETZ [this *Bulletin*, 1954, v. 51, 72] have been recovered from 2 species of rodent in the Transvaal experimentally infected with cercariae from wild snails. Further transmission experiments to 4 other wild rodent species produced similar ova together with normal *S. mansoni* ova. Naturally infected wild rodents caught

in an endemic area of *S. mansoni* also yielded ova, some of which were of the same abnormal type, the proportion of these varying according to the definitive host. Strains of *S. mansoni* from man transmitted to 5 species of wild rodents yielded similar abnormal ova as well as typical specimens. *S. mansoni* cercariae were used to infect white mice and 2 species of wild rodents which were divided into 3 groups and fed with cassava, white bread and mouse cubes respectively. Only one of the first group survived until the worms reached maturity, and it contained only 4 worms and no ova. Livers of rodents fed on mouse cubes contained normal *S. mansoni* ova but few worms or ova were found in *Mystromys*. Of the rodents fed on white bread, mice and *Mastomys* harboured normal ova, but more than 40% of eggs in *Mystromys* were of the abnormal *S. mansoni* type.

The abnormal eggs are described and illustrated and they correspond to Schwetz's description. *S. mansoni* var. *rodentorum* has been found only in *S. mansoni* areas and infected rodents harbour few adult worms. The authors conclude that *S. mansoni* var. *rodentorum* is in all probability *S. mansoni* "modified in its morphology . . . by its adaptation to its environment".

T. H. Davey

Dodin, A., Capron, A. & Brygoo, E. R. Enzymes de *Schistosoma mansoni* (Sambon, 1907). Mise en évidence qualitative d'un histaminooxydase et d'une succinodéshydrogénase chez la cercaire *in vivo*, et le Schistosome adulte *in vitro*. [**Enzymes of** *Schistosoma mansoni*. **Qualitative Demonstration of a Histamino-oxidase and of a Succino-deshydrogenase in the Cercaria** *in vivo* **and in the Adult Worm** *in vitro*] *C.R. Soc. Biol.* 1960, v. 154, No. 3, 575–8.

See this *Bulletin*, 1959, v. 56, 848, 953.

Pellegrino, J. & Memoria, J. M. P. A Reação intradérmica na esquistossomose mansoni. I. Ensaios comparativos com antigenos de cercária, verme adulto, ôvo e miracídio. [**The Intradermal Test in the Diagnosis of** *Schistosoma mansoni* **Infection. I. Comparison of Cercarial, Adult Worm, Egg and Miracidial Antigens**] *Rev. Inst. Med. Trop. São Paulo.* 1960, May–June, v. 2, No. 3, 171–6, 3 figs. [10 refs.] English summary.

5 groups of patients suffering from *Schistosoma mansoni* infection were tested intradermally with various antigens made from: (1) ova; (2) miracidia; (3) cercariae; and (4) adult *S. mansoni*, as follows. Group A contained 50 males aged 20–35 years, tested with antigens 3 and 4 in dilutions of 1 in 10^3, 1 in 10^4, and 1 in 10^5; group B comprised 40 males aged 16–18 years, tested with 3 and 4 diluted 1 in 10^3; group C, 16 males aged 20–35 years were tested with 3 and 4, and with a mixture of equal parts of both; group D, 56 males aged 20–40 were tested with 1, 3, and 4 diluted 1 in 2,000; group E, 33 males aged 25–40 years were tested with 1, 2, and 3 diluted 1 in 2,000.

0·05 ml. of each antigen was injected intradermally into the forearm and the result read 15 minutes later, areas of 1·2 sq. cm. being considered a positive

result. The results subsequently analysed statistically were as follows. In group A, cercariae gave more positive results in the higher dilutions, adult worms in the 1 in 1,000; in group B there was no significant difference between them; group C, *idem*; in group D, antigen 1 was much less active, for 3 and 4 there was no significant difference; in group E, antigen 3 gave most positives, then 1, and finally 2.

In a group of 454 children in an endemic area, 262 were positive with antigen 2, and 250 with 4. 14 were positive to 3 and negative to 4; in 11 the contrary was the case. In 522 out of a group of 558 soldiers, the results of antigens 3 and 4 agreed. In 350 children aged 10–15 years and in 260 adults all suffering from schistosomiasis the coefficient of correlation (r) was +0·646, and +0·753 respectively for antigens 3 and 4. The authors point out that the reactions were less intense in group B (younger patients) and that antigens 1 and 2 gave less intense reactions, while antigen from adult worms is easier to prepare and is reliable.

They did not confirm the observations of OLIVER-GONZALES *et al.* who found patients infected with *S. mansoni* who were negative to an antigen made from ova [this *Bulletin*, 1955, v. 52, 459]. *W. K. Dunscombe*

ASKAR, O. **Portal Hypertension in Egyptian Splenomegaly.** *J. Egyptian Med. Ass.* 1960, v. 43, Nos. 1/2, 32–42. [30 refs.]

The author describes his method of measuring the portal blood pressure by direct manometry during laparotomy in patients with Egyptian splenomegaly. The series consisted of 26 patients admitted to the Kasr El-Aini Hospital between 1955 and 1958 with the diagnosis of endemic splenomegaly. In every patient the spleen reached down to at least midway between the costal margin and the umbilicus.

After finding that a sharp pointed needle was not satisfactory for the puncture of the vein owing to leakage of blood, the author tied into the selected vein a short, wide, straight and blunt catheter. This was connected to a glass tube some 50 cm. in length filled with saline. In earlier cases he used a vein from the lower ileal mesentery but after a complication of mesenteric thrombosis he then employed one of the gastro-epiploic veins. By using both sites in several cases he established that the pressure in each set of veins was identical.

The lowest reading obtained in the series was 280 mm. saline and the highest was 460 mm. In a control series [the numbers tested are not stated] the pressure was between 80 and 120 mm. saline. The ages of the patients in the series ranged from 12 to 43.

In a brief summary of the literature on the subject he has little to add. He considers that indirect manometry of the portal blood pressure by the usual methods cannot replace direct measurement. He mentions that the use of cardiac catheterization to measure the hepatic venous pressure is still under investigation as a means of determining " occluded " portal pressure. He finds that liver biopsy in cirrhosis is a procedure not free from serious complications and considers that its value has been over-estimated.

He concludes that a pressure over 200 mm. saline represents a definite portal hypertension. *J. R. Rose*

CHAVES, E. Cor pulmonale crônico esquistossomótico. II. Alguns aspectos das lesões vasculares pulmonares causadas pelos ovos de *S. mansoni*. [**Chronic "Cor Pulmonale" in Schistosomiasis. II. Some Aspects of Vascular Lesions in Lungs caused by** *S. mansoni* **Eggs**] *Rev. Inst. Med. Trop. São Paulo.* 1960, May–June, v. 2, No. 3, 163–70, 8 figs. [26 refs.] English summary.

Certain aspects of the autopsy reports on 6 patients who had had chronic schistosomal cor pulmonale are reported. Granulomas in varying stages of formation were found, together with a necrotizing vascular reaction centred round one or more ova of *Schistosoma mansoni* affecting the vascular endothelium and eventually the inner elastic membrane and the media. In a number of instances ova were seen penetrating the dilated collaterals, often forming arterio-venous fistulas.

The author states that the lesions found were directly due to the action of the ova and their products; where there was evidence of re-infection, necrosis, arteritis and arteriolitis were the vascular lesions most often seen. They were probably a specific hypersensitivity reaction against toxins elaborated by the miracidium, while a circumscribed eosinophilic alveolitis also suggested an allergic reaction to the parasite. Cure may leave a semi-obliterating endarteritis which when sufficiently extensive can cause pulmonary hypertension leading to the full cor pulmonale syndrome.

The author calls special attention to the arterio-venous fistulas caused by the schistosomal granulomas localized in the interior of the dilated collaterals. These fistulas represent the principal method of embolic dissemination of ova into the general circulation and it is considered that the pulmonary hypertension found can contribute to this. *W. K. Dunscombe*

EL-BITASH, M. H., ABDALLAH, A., SAIF, M. & TAHA, A. **Evaluation of the Efficiency of 1-p-Aminophenoxy-5-Phthalimidopentane in the Treatment of Schistosomiasis (a Preliminary Report).** *J. Egyptian Med. Ass.* 1959, v. 42, No. 12, 705–18.

Many compounds of the p-aminophenoxy alkane series have experimentally been shown to exert marked schistosomicidal activity; but their toxicity, in particular to the retina, has precluded their use in man [*e.g.* see this *Bulletin*, 1955, v. 52, 997]. M & B 2948A (1-p-aminophenoxy-5-phthalimidopentane-$NH_2.C_6.H_4.O(CH_2)_5N.CO.C_6H_4CO$) is another drug of this series. It is a yellow microcrystalline powder, only very slightly soluble in water and is odourless and tasteless; it can be given orally and is rapidly absorbed. Mice, rats, dogs and monkeys tolerate the drug in appreciable dosage without gross evidence of toxicity; it may cause vomiting in cats and it produces localized retinal destruction in some of them if given daily in repeated dosage.

Tests on Swiss mice showed the maximum daily dose tolerated for 4 days by them to be 400 mgm./kgm. of body weight. *Schistosoma mansoni* infections in these mice were treated with 200 mgm./kgm. or 400 mgm./kgm. daily for 4 days; the first of these doses was not as effective as the second. On autopsy fewer worms were recovered after the larger dosage; of those recovered a greater proportion was in the portal vein than was the case after the lesser

dosage; also no living ova were to be found in the faeces. The lesser dosage apparently cured 2 of the 6 mice so treated, while the greater cured all of the 6 treated.

After thorough preliminary investigation, including liver and kidney function tests but excluding retinoscopy, 33 Egyptian patients with schistosomiasis (24 urinary *S. haematobium*, 1 intestinal *S. haematobium* and 8 *S. mansoni*) were treated with M & B 2948A. The patients were divided into several groups according to the nature of their infections and the drug dosage. In all cases but one the total amount of the drug given was either 250 or 300 mgm./kgm. body weight, and it was divided into doses administered every 12 hours over 2. 5 or 6 days; the remaining patient, with intestinal *S. haematobium* infection, was given a total of 450 mgm./kgm. at 8-hour intervals over 6 days. The attempted 2-day treatment (7 patients) caused such severe colic, loin pains and strangury that it was abandoned in every case after half the course; 5- and 6-day treatments, even with a total of 450 mgm./kgm. caused no clinical or other evidence of toxic effect.

Of the 8 patients with urinary disease due to *S. haematobium* treated with 250 mgm./kgm. all but one gained relief as judged by a fall in the number of living eggs passed in the urine, and 4 of the 8 appeared to be cured of their infections as judged over a follow-up of 18–34 days. 4 patients with *S. mansoni* similarly treated continued to pass living eggs in the stools, though in lesser numbers. Of 9 urinary disease patients given 300 mgm./kgm. 5 apparently were cured and the others were materially relieved. Of 3 with intestinal *S. mansoni*, also given 300 mgm./kgm., one was apparently cured and the other 2 were relieved, as judged by the fall in numbers of eggs passed in the stools. The single *S. haematobium* case of intestinal infection was apparently cured by a total of 450 mgm./kgm.

In none of the patients treated was there complaint of visual disturbance, but detailed eye examinations were not undertaken. *A. R. D. Adams*

ABDALLAH, A., SAIF, M. & TAHA, A. **The Therapeutic Value of Glucosamine in Schistosomiasis.** *J. Egyptian Med. Ass.* 1959, v. 42, No. 11, 631–5. [11 refs.]

In view of the rapid anaerobic glycolysis which occurs in schistosomes, glucosamine has been tried as a therapeutic agent. One batch of 6 mice infected with *Schistosoma mansoni* was given 100 mgm./kgm. daily for 15 days, another batch was given 200 mgm./kgm. daily for 10 days and a third was kept as control. The mice were observed for 2 months and then killed. All the mice continued to pass viable eggs; but at autopsy there had been a hepatic shift of worms in the treated batch and none in the control group. In a clinical trial 8 male patients, each infected with both *S. mansoni* and *S. haematobium*, were studied. 4 patients were given 6 gm. daily by mouth for 20 days, one patient was given 12 gm. daily for 15 days and 3 patients were given 12 gm. daily for 20 days. There was no significant reduction in the number of ova passed in the urine and faeces, and there were no toxic reactions. It is concluded that there was no significant therapeutic activity. *F. Hawking*

HABIB, S. A. & HABIB, Y. A. **Effect of Chlorothiazide in Bilharzial Hepatic Fibrosis with Ascites.** *J. Egyptian Med. Ass.* 1959, v. 42, No. 11, 636–53, 3 figs. [13 refs.]

Chlorothiazide given orally is an effective diuretic. After preliminary investigations 16 Egyptian patients with hepatic fibrosis and ascites due to *Schistosoma mansoni* infection were given the drug under close clinical and biochemical supervision. The dosage was 500 mgm. (1 tablet) every 6 hours for 11 days; 4 of the patients were given 12 gm. of potassium citrate also daily on and after the 9th day of this treatment; the fluid intake of each patient was controlled; it ranged from 750 to 2500 ml. daily. Diuresis was pronounced in all, being marked by an increase in urine output of 80 to 580% after the first day of treatment. There was some increase in potassium ions, and considerable and parallel increase in the urine of sodium and chloride ions. 14 of the patients lost weight of 1 to 20 kgm., the average loss being 7·8 kgm. One patient had put on weight to the extent of 5·5 kgm. by the end of treatment; another failed to lose more than 2 kgm.; both these patients had a pyelonephritis. Ascites had disappeared in 4 patients by midway in the course, and in another 2 by its completion. The potassium, sodium and chloride levels in the blood plasma fell markedly, and the bicarbonate increased.

Chlorothiazide proved valuable in the relief of schistosomal hepatic fibrosis with ascites, except in those patients with pyelonephritis. It has no adverse effect on the kidneys, and is superior in this respect to the mercurial diuretics.

A. R. D. Adams

FAYEZ, M. & RAGHEB, M. **Effect of Trivalent Antimony Treatment of Schistosomiasis on Liver Function Tests.** *J. Egyptian Med. Ass.* 1959, v. 42, No. 12, 719–26. [28 refs.]

Liver function tests were done on 20 Egyptian patients with schistosomiasis but with little or no evidence of liver involvement, and on 20 with the same disorder but severe liver involvement. After treatment with stibophen these tests were repeated in each case. It appeared that the drug treatment caused no damage to those whose livers functioned normally before it, but it increased the damage in all of those who already showed evidence of liver dysfunction. The latter finding is in contrast to that of some previous workers.

A. R. D. Adams

MEIRELES, P. N. & MACHADO, G. R. Alterações electrocardiográficas determinadas pelo gluconato de sódio e antimonila, no tratamento da esquistossomose mansônica. [**Electrocardiographic Alterations determined by Sodium Antimonyl Gluconate in the Treatment of** *Schistosoma mansoni* **Infections**] *Rev. Inst. Med. Trop. São Paulo.* 1960, May–June, v. 2, No. 3, 177–81, 3 figs. English summary.

The authors studied 21 patients in 3 groups, who were suffering from an infection by *Schistosoma mansoni*, none of whom had been previously treated. The number of patients and their ages in each group were : (A) 9 aged 11–20 years; (B) 9 aged 21–30 years; (C) 3 aged 31–40 years. 8 patients had intestinal

disease only; in the remainder the hepatosplenic form was present either by itself or combined with intestinal or pulmonary infection. In all but 1 the clinical, X-ray and ECG tests on the heart were normal. ECG readings were made at the beginning of treatment, on the 3rd and 6th days, and 2 days after treatment, and repeated subsequently at various intervals. Treatment was by Triostib, a gluconate of Na and Sb containing 67·5 mgm. Sb in each 0·225 gm. ampoule of the salt, given intravenously for 6 days at a total dose of 20 mgm./kgm. body weight divided into 6 doses. In 3 patients treatment was repeated 44, 58, and 47 days respectively after the end of the first treatment.

All the patients showed ECG changes during treatment affecting especially the ST interval and the T wave; these mostly started on the 3rd day. In 13 the changes returned to normal by the 51st day, and in some even in 9 days. The authors think that the disturbances relate to the regeneration of the heart muscle fibres affected by the Sb; their importance if treatment has to be repeated is obvious. *W. K. Dunscombe*

NAIMARK, D. H., BENENSON, A. S., OLIVER-GONZÁLEZ, J., MCMULLEN, D. B. & RITCHIE, L. S. **Studies of Schistosomiasis in Primates: Observations on Acquired Resistance (Progress Report).** *Amer. J. Trop. Med. & Hyg.* 1960, July, v. 9, No. 4, 430–35, 2 figs. [14 refs.]

Monkeys (*Macaca mulatta*) were exposed to 1,000 cercariae of *Schistosoma mansoni*. Maximum egg excretion persisted for about 60–90 days; then the excretion of eggs was at a low level by 200 days and it became negligible within 300 days. When these monkeys were challenged by fresh cercariae 2 years after the first exposure, no increase or renewal of excretion of eggs occurred. A second group of monkeys was exposed monthly for 26 months to about 25–50 cercariae each. Egg counts increased for 200 days, then remained moderately high for 300 days and after that sharply declined almost to zero. In other animals which acquired only light infections, there was little resistance to additional exposures 250–500 days later. There was much individual variation in the natural and acquired resistance of the different monkeys.

When resistant animals were challenged by a second exposure to cercariae, no worms were found in the liver 6 days later, but a few schistosomules were found 15 days later. At 22–62 days, about 10% of the cercariae had reached the liver but the worms were stunted and unlikely to reach maturity. These findings of acquired resistance in monkeys are similar to those of VOGEL and MINNING [this *Bulletin*, 1954, v. 51, 409]. *F. Hawking*

WEINMANN, C. J. & HUNTER, G. W. **Studies on Schistosomiasis. XIV. Effects of Cortisone upon the *Schistosoma mansoni* Burden in Mice.** *Exper. Parasit.* New York. 1960, June, v. 9, No. 3, 239–42, 1 fig. [12 refs.]

COKER [this *Bulletin*, 1958, v. 55, 183] has reported that cortisone enhanced the natural resistance of mice to the cercariae of *Schistosoma mansoni*, and the present work was undertaken to confirm and amplify this report. Mice were exposed to cercarial infection and were treated daily with 0·5 mgm. cortisone

subcutaneously for various periods. Similar mice were treated with saline as controls. After 6–8 weeks from infection the mice were killed and the number of worms present was counted. Those mice which had received cortisone for a week beginning on the day of infection, or on the 15th day of infection, showed fewer worms (30–50% fewer) than the control mice, and the difference was statistically significant. Mice which were treated with cortisone in the 4th–5th weeks of infection showed no significant difference in the number of worms. The treated mice tended to contain more male than female worms.

F. Hawking

OKPALA, I. **A New Method of Testing Drugs in Experimental Schistosomiasis mansoni in Golden Hamsters** (*Cricetus auratus*). *West African Med. J.* 1959, June, v. 8 (n.s.), No. 3, 94–101.

Hamsters were infected by the usual methods with sufficient cercariae to kill most of the untreated controls, usually in 154 days after infection. 35 days later, selected groups were treated orally daily for 10 days. (Fuadin and TWSb were given intramuscularly.) When most of the animals in one group had died, all the others were killed and the results of treatment were assessed in the usual way by counting the worms and weighing the liver. The basis for claiming that this is a new method is the fixing of the date of autopsy by the natural death of most of the controls.

Five drugs were tested by this technique, *viz.* Fuadin, Win 4304, Miracil D [lucanthone], Miracil A and TWSb. In the ability to delay the death of treated animals the drugs stood in the following order of increasing potency: Miracil A, Win 4304, Miracil D, Fuadin and TWSb. *F. Hawking*

HEWITT, R. & GILL, Edna. **The "Lung Shift" of** *Schistosoma mansoni* **in Mice following Therapy with Tartar Emetic or Miracil D.** *Amer. J. Trop. Med. & Hyg.* 1960, July, v. 9, No. 4, 402–9, 1 fig. [16 refs.]

During the treatment of mice infected with *Schistosoma mansoni* it was found that some of the worms, which disappeared from the usual sites during treatment, could be found in the lungs. A few were also found in the heart, spleen and kidneys. In searching for such worms, the lungs were torn apart with tweezers or the organs were pressed between glass plates. In untreated mice, 35% of the worms were found in the mesentery, 63% in the portal vein, 1% in the liver and 2% in the lungs. 3 days after treatment with tartar emetic, there were no worms in the mesentery, 8% in the portal vein, 69% in the liver and 23% in the lungs. The shift began within 24 hours of the first treatment. Similar results were observed after treatment with lucanthone (Miracil). Little gross damage was seen in areas of the lungs near living worms, but haemorrhage and consolidation occurred near some of the dead ones. Among the worms found in the lungs and liver after tartar emetic treatment, there were more males than females. It is recommended that in examining mice treated with new compounds, the lungs should be examined as well as the liver. The worms probably reach the lungs by passing through non-capillary shunts.

F. Hawking

LUTTERMOSER, G. W., BRUCE, J. I. & MCMULLEN, D. B. **The Prophylactic and Curative Activity of 1-Maleinyl-4-(3′-Chloro-4′-Methyl-Phenyl)-Piperazine (Hoechst S 688) in Experimental Schistosome Infections.** *Amer. J. Trop. Med. & Hyg.* 1960, Jan., v. 9, No. 1, 39–45. [10 refs.]

Hoechst S 688 is tolerated orally by mice at 700 mgm./kgm. and by monkeys at 200 mgm./kgm. Its action against *Schistosoma mansoni* in mice has previously been reported by DE MEILLON *et al.* [this *Bulletin*, 1956, v. 53, 1443] and LÄMMLER [*ibid.*, 1959, v. 56, 744]. In the present experiments the drug was given to mice by mouth soon after exposure to infections. If a single dose of 60–120 mgm./kgm. was given within 3 days of infection, about 90% of the schistosomes were prevented from developing. If the drug was given on each of the first 3 days, practically all the worms were killed. On the other hand, 3 daily doses of 240 mgm./kgm. or 5 daily doses of 125 mgm. gave hardly any protection to 2 monkeys which were exposed to infection. There was some protection in 3 dogs given 25 mgm./kgm. daily for 3 days after exposure to *S. japonicum* cercariae. There were no toxic effects in these dogs.

In mice which were treated 6–8 weeks after infection doses of 50 mgm./kgm. by mouth or 60 mgm./kgm. intraperitoneally on 5 consecutive days were ineffective, but a single oral dose of 72 mgm./kgm. or 120 mgm./kgm. sterilized many of the mice. Larger single doses of 240 and 500 mgm./kgm. were slightly more effective, although these large doses were not completely absorbed from the peritoneum. In another series of mice which were treated with a single oral dose of 72–120 mgm./kgm. and then killed at intervals, it was found that none of the worms had died after 7 days, 28–40% died after 2 weeks, 64–81% after 3 weeks, 91% after 4 weeks and 98% after 7 weeks. In mice treated intraperitoneally with a single dose of 240 mgm./kgm. none of the worms had died after 4 weeks but all were dead after 7 weeks.

3 monkeys infected with *S. mansoni* were treated by mouth. One received 100 mgm./kgm. daily for 5 days while 2 received 240 mgm./kgm. daily for 2 days (these latter doses caused ataxia and convulsions). In the first monkey most but not all of the worms were killed. In the other 2, egg production returned after 30 days and a second course of 240 mgm./kgm. was given daily for 5 days; 21 days later the monkeys were killed and practically all the worms were dead.

In a dog with *S. japonicum* infection, a course of low doses (10 mgm./kgm.) by mouth daily for 5 days had no therapeutic effect.

[This seems to be an active compound which deserves further careful investigation.] *F. Hawking*

SOBRERO, R. Animali domestici ospiti naturali di *Schistosoma bovis* in Somalia. [**Natural Domestic Animal Hosts of** *Schistosoma bovis* **in Somalia**] *Riv. di Parassit.* Rome. 1960, June, v. 21, No. 2, 125–30, 1 fig. [12 refs.] English summary.

Sobrero has investigated *Schistosoma bovis* infecting cattle, camels, a goat and a donkey in Somaliland. He examined the carcases of 355 head of cattle slaughtered during March–June 1957 and found 134 (38%) positive. In heavy infections the parasite had spread to the portal venous system causing liver

changes which are said to be characteristic. The normal seat of the parasites is in the mesenteric veins, in the 4 species of animals here reported upon.

The camel was found to be much less frequently and less heavily infected than cattle and this is attributed to the difference in the habits of these 2 animals. Cattle graze the irrigated and frequently flooded plains of the Juba and Webi Shebeli rivers, where *Bulinus abyssinicus* and *B. forskali* abound, while camels are mostly in the more northern parts of Somaliland and they water at wells or running streams where the vector is not to be found.

S. indicum, but not *S. bovis*, has been demonstrated in dromedary animals before and Sobrero's paper includes a differential table of the 2 species of helminths. Except for being somewhat on the small side, the author's specimens of *S. bovis* closely corresponded to the type species. *J. Cauchi*

GIANOTTI, F. & LUVONI, R. La patologia cutanea degli addetti alla monda ed al trapianto del riso. Rilievi ecologici sui molluschi ospiti intermedi delle cercarie ai fini della prevenzione. [**Dermatitis of Workers in Rice Fields. Ecological Investigations on Snails which are Intermediate Hosts of the Cercariae, for Preventive Purposes**] *Rass. Med. Indust.* Turin. 1960, Mar.–Apr., v. 29, No. 2, 115–26, 1 map. [10 refs.] English summary.

In previous papers [see *Bull. Hyg.* 1956, v. 31, 163; this *Bulletin*, 1958, v. 55, 1250] the authors had established that apart from trauma of the skin by the actual rice spikes, 3 forms of dermatitis of rice-workers occur, 2 of which, at least, are due to penetration of the skin by cercariae of trematodes, the intermediate snail hosts being present in large numbers in the rice fields of northern Italy. The object of the present paper was to determine the ecology of the snails with a view to prevention.

Examination of many thousands of snails of the following genera and species —*Lymnaea* (*stagnalis, palustris, auricularia, truncatula* spp.) and *Planorbis* (*marginatus, corneus* spp.)—showed cercariae in a large number, many of which were *Cercaria ocellata*.

Special attention was paid to the system of irrigation of the rice fields and it was found that actually 2 systems existed: (a) one using fresh or conduit water, in which no snails developed; (b) a system in which the drainage from system (a) was collected and mixed together with discharges from near-by dairy farms which always contained human and animal residues; here the channels always contained water even in winter and had a very large snail population. In the months during which rice-planting, transplanting, weeding, and harvesting occur the rice fields containing snails and thus those where cercarial dermatitis occurs, are the only fields which receive this mixed system of irrigation. This suggested a change to system (a) as a preventive measure which would be much cheaper than the use of molluscicides, though even then a molluscicide is advisable in the winter months before irrigation begins.

The authors further observed that of the snails *Planorbis corneus*—a possible host of *C. ocellata* very apt to produce dermatitis—and *Lymnaea stagnalis*, the former was very much more resistant to preventive measures. They also observed that the start of emission of cercariae was in April–May *i.e.* at the beginning of rice planting. Finally, they tested intradermally 40 rice-workers, who had actual cercarial dermatitis, with an antigen made from an extract of

Schistosoma japonicum, to see if they had been sensitized; the reaction was negative, but it is suggested that it be repeated with extracts of both *S. haematobium* and *S. mansoni*. *W. K. Dunscombe*

PACHECO, G., WYKOFF, D. E. & JUNG, R. C. **Trial of an Indirect Hemagglutination Test for the Diagnosis of Infections with** *Clonorchis sinensis*. *Amer. J. Trop. Med. & Hyg.* 1960, July, v. 9, No. 4, 367–70, 1 fig. [19 refs.]

The indirect haemagglutination test, with the use of tanned red cells, has been used previously for the detection of certain nematode, cestode and schistosome infections [see, for example, this *Bulletin*, 1960, v. 57, 265], but the present paper appears to contain the first report on its employment for detecting the presence of flukes other than those inhabiting the blood stream.

The authors' summary is as follows:—

"An indirect tanned-cell haemagglutination test was used for the detection of *Clonorchis sinensis* infections in man and rabbits. A comparison of the results from this test with those obtained earlier from a complement fixation test in which the same extract and the same sera were used [*ibid.*, 1960, v. 57, 261] showed the tanned-cell haemagglutination test to be relatively more sensitive. Specificity as well as sensitivity of the test was found to be increased by treating the dried worms with ether prior to saline extraction. With the ether treated material cross reactions were lacking in tests of a limited number of sera from animals and humans with *Schistosoma* and *Paragonimus* infections."

R. M. Gordon

HATANO, K. **[Epidemiological Studies on Paragonimiasis in Minami-Uwa-Gun, Ehime-Ken—Mass Examination for Paragonimiasis]** *Japanese J. Parasit.* 1960, June, v. 9, No. 3, 294–308, 4 figs. on 2 pls. [50 refs.] [In Japanese.]

The English summary appended to the paper is as follows:—

"Mass examination against paragonimiasis was carried out to 3,116 pupils of 6 primary and secondary schools along the basin of the River Sozu in Minami-Uwa-Gun, Ehime-Ken, applying intradermal test to all of them, and further applying egg test and complement fixation test to the positive and quasi-positive cases. A few noticeable points were experienced concerning discrimination between pulmonary tuberculosis and this disease when mass examination against tuberculosis was carried out in prevalent districts and some other epidemic tests were also carried out.

"The results obtained were as follows:

"1) 72.8% out of the positive cases for intradermal test were positive for complement fixation test, and 68.5% out of the above were positive for egg test. 10.7% out of the negative cases for complement fixation test were positive for egg test.

"2) The comparison of the egg detection rate between sputum and stool examinations which were both carried out in 131 cases shows that there is not much difference, the rate being 35.1% from the stool test and 41.2% from the sputum test. But the fact that there were many cases in which eggs were

detected only from one or other of the two tests shows that both tests are necessary for detection of eggs.

" 3) Comparing the results of the mass examination for tuberculosis carried out in 1955 with those of this time, we find 27 children (77.1%) out of 35, who were diagnosed as pulmonary tuberculosis in the preceding examination, to be paragonimiasis, since they were positive for egg test and no tuberculosis germs were proved.

" 4) Out of 66 paragonimiasis cases which were detected through intradermal test, 54.5% were noticed as abnormal through X-ray.

" 5) The results of intradermal test applied to 47 patients and all of their family members, show that this disease has a fairly strong accumulative nature to the family. It is necessary to carry out systematic examination against this disease where it is prevalent at the same time when mass examination against tuberculosis is carried out."

FACEY, R. V. & MARSDEN, P. D. **Fascioliasis in Man: an Outbreak in Hampshire.** *Brit. Med. J.* 1960, Aug. 27, 619–25, 3 figs. [Numerous refs.]

An outbreak of infection with *Fasciola hepatica* occurred in man in Hampshire. At least 6 patients were affected and in 5, eggs of the parasite were found in the faeces. All had eaten water-cress grown in natural beds.

The onset of the illness is usually abrupt, with pain in the right hypochondrium, enlargement of the liver, urticaria and a high eosinophilia. Eggs occur in the faeces 3 or 4 months after infection but may be difficult to demonstrate unless a formol-ether method is used. Chloroquine relieved the symptoms in these patients but did not eliminate the parasite.

The outbreak in man occurred during the wet summer of 1958, and in an attempt to trace the outbreak, water-cress from the local bed in a cow pasture was fed daily to 4 newly weaned rabbits for 5 dry summer months in 1959, but no infection was acquired.

Full details are given of the patients in case histories and in a table.

W. E. Kershaw

ENIGK, K. & DÜWEL, D. Zur Bekämpfung von *Galba truncatula* (Limnaeidae) durch Natriumpentachlorphenolat. **[The Control of *Galba truncatula* (Limnaeidae) by Sodium Pentachlorphenolate]** *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1960, v. 11, No. 2, 134–51, 5 figs. [Numerous refs.]

In Europe, *Galba truncatula* is the only vector of *Fasciola hepatica.* Its control involves the treatment of small ditches and larger ponds; large areas of running or standing water should not be treated in Germany because of laws about domestic water supplies. When exposed for 4 days *G. truncatula* and *Radix ovata* were all killed by 1 p.p.m. of sodium pentachlorphenolate while other snails, *e.g. Planorbis*, required 14–18 p.p.m. The eggs of *Lymnaea stagnalis* were killed by 2 p.p.m. at 10°C. in 24 hours while 40 times as much copper sulphate was required to produce the same result. When tested against *Fasciola hepatica*, the eggs were completely resistant to 40 p.p.m. of the compound, all the miracidia were killed by 5 p.p.m. in 215 minutes, and most of

the metacercariae were killed by 25 p.p.m. in 12 hours at 16°C. As regards the influence of temperature, at 20°C., 4 p.p.m. killed all *Lymnaea* and *Stagnicola* snails in 24 hours, at 10°C. 5 p.p.m. killed, at 0°C. 6 p.p.m. killed. On the other hand, sodium pentachlorphenolate is gradually destroyed by bright sunlight, the ultraviolet rays being responsible for this destruction. Diffuse sunlight has little effect. The compound is not destroyed by conditions of hydrogen ion concentrations or salts found in natural waters. When the compound was applied to grass, it could not be detected 9 days later; similarly the compound was destroyed or inactivated by mud and water plants within 7 days.

In the concentrations required to kill snails, sodium pentachlorphenolate is non-toxic for land mammals but it is highly toxic for fish, tadpoles, crayfish and other aquatic animals which have gills. Aquatic arthropods (without gills) tolerate concentrations of 10 p.p.m. for more than 3 days, but most ciliated protozoa are killed within 48 hours. When the compound is applied to natural waters, its concentration gradually diminishes and the fresh-water fauna regenerate within 3 weeks (but not *G. truncatula* snails). Algae were damaged but not completely destroyed by 10 p.p.m. for 48 hours. Grass and aquatic plants suffer a temporary damage to the parts above ground, but they soon recover. The compound is not absorbed by the roots of plants to any significant extent.

Sodium pentachlorphenolate is much more effective as a molluscicide than copper sulphate, but its use should be supervised by an expert, in order to get the best results and to avoid toxic effects on man, animals and fish.

[This is a good paper, containing many useful data and it should be consulted in the original by those concerned with this subject.] *F. Hawking*

BROWN, H. W. *et al.* **The Treatment of *Fasciolopsis buski* Infections with Dithiazanine Iodide, 1-Bromo-Naphthol-(2), Ascaridol, Piperazine and Tetrachlorethylene.** *J. Formosan Med. Ass.* 1959, Dec. 28, v. 58, No. 12, 792–8.

The authors report the results of treatment of 44 patients [ages not stated] infected with *Fasciolopsis buski* in Taiwan. Stool examinations were done before and after treatment by the Stoll dilution and antiformin-ether techniques and stools were searched for worms for several days after treatment.

Dithiazanine iodide, given to 7 patients (200 mgm. once or twice a day for 10 days) had some effect on light infections. The vomiting, abdominal discomfort and diarrhoea it caused were tolerable.

1-bromo-2-naphthol (Wormin) given to 5 children (2 gm. base) as granules twice a day for 5 days, with a saline purge 2 hours after the last dose, reduced the egg count of 4 patients and freed the stool of 1 patient from eggs. Side effects were abdominal pain and headache.

Piperazine citrate tablets, each containing the equivalent of 0·25 gm. or 0·5 gm. as piperazine hexahydrate, and piperazine malate syrup, each ml. of which contained the equivalent of 100 mgm. of piperazine hexahydrate, both appeared to be ineffective. The citrate was given to 9 patients, 5 receiving a single dose equivalent to 2·25 gm. of the hexahydrate on an empty stomach in the morning and 4 receiving the equivalent of 3·5 gm. of the hexahydrate daily for 5 consecutive days. The malate syrup was given to 6 patients, the dose being

equivalent to 2·4 gm. of the hexahydrate on a empty stomach in the morning. No purges were given after this drug. Slight dizziness, headache, abdominal pain and vomiting were caused.

Ascaridole, in the form of Astin made in Taiwan, each gm. of which contained 5% of ascaridole and 95% of castor oil, was given to 8 children on an empty stomach in the morning in doses containing 0·4 gm. of ascaridole and 7·6 gm. of castor oil. These doses cured 5 patients and reduced the egg count of 1 patient from 900 to 100.

Tetrachlorethylene was given to 9 patients in doses of 2·4 or 3 ml. with a saline purge 2 hours later. This cured 7 patients and the egg counts of the other 2 were reduced from 500 to 200 and 5,400 to 200 respectively. This was, therefore, the most effective drug tried, though it caused headache, dizziness and abdominal pain. *G. Lapage*

COLLOMB, H., DESCHIENS, R. & DEMARCHI, J. Sur deux cas de distomatose cérébrale à *Heterophyes heterophyes*. **[Two Cases of Cerebral Lesions due to** *Heterophyes heterophyes***]** *Bull. Soc. Path. Exot.* 1960, Mar.–Apr., v. 53, No. 2, 144–7.

FRASER, Phyllis G. **The Form of the Larval Hooks as a means of Separating Species of** *Diphyllobothrium*. *J. Helminthology*. 1960, v. 34, Nos. 1/2, 73–80, 2 text figs. & 4 figs. on pl.

SILVERMAN, P. H. & GUIVER, K. **Survival of Eggs of** *Taenia saginata* **(The Human Beef Tapeworm) after Mesophilic Anaerobic Digestion.** *J. & Proc. Inst. Sewage Purification*. 1960, Pt. 3, 345–7.

The infection of cattle with *Cysticercus bovis* has, apart from the potential danger of human tapeworm infection, the great disadvantage of causing considerable economic loss through the down grading or rejection of infected carcases.

In the experiments described in this paper with particulars of the tests employed, eggs of *Taenia saginata* obtained from Kenya were tested for viability by an *in vitro* method and then added to raw sewage sludge which was kept in an experimental digester at a temperature of 35°C. for up to 20 days. The results of the experiments were that eggs in samples taken from the digester on the 5th and later days were non-viable as judged by the *in vitro* test and by microscopical appearance. Controls were conducted on eggs kept in synthetic BOD dilution water at 35°C. for 20 days and under these conditions the eggs also became non-viable. However, in controls maintained at 4°C. the eggs remained 50–60% viable. Feeding experiments on 2 calves confirmed these findings. These results which are discussed " strongly suggest " that tapeworm eggs may be inactivated under mesophilic anaerobic conditions by even a short period of retention.

[See also this *Bulletin*, 1949, v. 46, 851; 1956, v. 53, 79, 622.]

M. E. Delafield

BENEX, Jacqueline & LAMY, L. Utilisation d'un antigène parasitaire polyvalent pour réactions de fixation du complément. **[Use of a Polyvalent Parasitic Antigen for Complement-Fixation Reaction]** *C.R. Soc. Biol.* 1960, v. 154, No. 3, 583–6.

The authors, when using the complement-fixation test, prepared a mixed antigen of *Echinococcus granulosus* (from horse and pig), *Taenia saginata, Cysticercus tenuicollis* and *Fasciola hepatica.* This antigen was tested against known sera from patients, and from immunized rabbits, and the results compared with those obtained when the same four ingredients of the antigen were used individually.

The authors conclude that the use of the mixed antigen is of practical value for diagnostic purposes, and that the inclusion of the fluke antigen does not interfere with the cestode reaction, or *vice versa.* From the quantitative viewpoint, the sensitivity of the mixed antigen (when allowance is made for the dilution) does not appear to be obviously affected. [A somewhat similar conclusion seems to have been reached by other workers when using antigens for the diagnosis of filarial infections. See this *Bulletin,* 1960, v. 57, 928.]

R. M. Gordon

MAZZOTTI, L. Encuesta sobre la frecuencia del quiste hidatídico en México. **[Survey of the Incidence of Hydatid Cysts in Mexico]** *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, Dec., v. 19, No. 4, 309–16, 1 graph. English summary (2 lines).

Tables and a map show the incidence in slaughtered animals in different areas.

KAGAN, I. G., NORMAN, Lois & ALLAIN, Dorothy S. **Studies on Echinococcosis: Serology of Crude and Fractionated Antigens prepared from** *Echinococcus granulosus* **and** *Echinococcus multilocularis. Amer. J. Trop. Med. & Hyg.* 1960, May, v. 9, No. 3, 248–61. [11 refs.]

Haemagglutination and bentonite flocculation tests with 7 crude *Echinococcus granulosus* and *E. multilocularis* antigens were done with antisera prepared in rabbits against these antigens, with serum from patients with proven infections of *E. granulosus* and serum from patients believed to be infected with *E. multilocularis.* In both tests absolute specificity was not observed with hydatid fluid, scolices, cyst and membrane antigens of the two cestode species. *E. granulosus* hydatid fluid proved to be the antigen of choice in both tests of sera from human beings with *E. granulosus* hydatid infections. Diagnostic tests with *E. multilocularis* antisera were not as satisfactory.

By precipitation with trichloracetic acid, 7 fractions were obtained from *E. granulosus* hydatid fluid, and 11 from *E. multilocularis* cysts. Some of these fractions did not react in either test. Fractionated antigens were more sensitive than whole antigens when used with antisera prepared in rabbits. The purified antigens were sometimes more active in the haemagglutination test but gave less reactions in the bentonite flocculation test. In diagnostic tests for *E. granulosus* hydatid infection, the whole hydatid fluid obtained from pig cysts

reacted as well as the antigen fractions. In *E. multilocularis* hydatid infections the fractionated antigens prepared from whole cysts gave better results.

W. E. Kershaw

TURSI, L. L'anchilostomiasi in Calabria. [**Ankylostomiasis in Calabria**] *Ann. d. San. Pubblica.* Rome. 1960, May–June, v. 21, No. 3, 721–79. [34 refs.] English summary.

The author, who is Medical Officer of Health to one of the 3 provinces of Calabria, dealing with the position in the whole administrative region, points out that the disease occurs chiefly on sandy clayey soils and is often associated with streams. The great poverty of the inhabitants, their almost complete lack of any idea of hygiene, the use of untreated material from cesspits for manure for horticulture, indiscriminate defaecation when working barefoot in the fields combine with high temperatures and humidity to provide optimum conditions for contracting the disease. Opportunities seem to be particularly plentiful when the olives are being harvested and in the harvesting of jasmine blooms. More women than men are attacked but men more severely. Although notification is compulsory the numbers received by no means reflect the real incidence.

There is an extensive consideration of preventive measures which are similar to those in other areas where like conditions exist. *W. K. Dunscombe*

BENARROCH, E. I. Anquilostomiasis infección y anquilostomiasis enfermedad. [**Hookworm Infection and Hookworm Disease**] *Gac. Méd. de Caracas.* 1959, Apr.–June, v. 67, Nos. 4/6, 391–422, 4 graphs. [14 refs.]

The author, from Caracas, discusses the persistent problem of distinction between infection with hookworms and the extent to which this may cause disease. He discusses with reference to the literature the many factors that might be taken into account, with special reference to the methods of egg counting used and their interpretation.

He then describes at length and with several tables and figures a study of intensity of infection with *Necator americanus* based on a survey made in the States of Aragua and Carabobo in 1950–51 to evaluate the results of a hookworm campaign. Egg counts were made by the Stoll method.

Comparisons were made between several areas in which sanitary measures had been introduced and others where there were no such facilities: the areas are listed. The main findings may be tabulated as follows.

	Areas with sanitary measures	*Areas without sanitary measures*
Number examined	5,445	1,991
Positive %	39	69
with 25 or less parasites	31·3	51
„ 26–99 parasites	6·0	14
„ 100 or more parasites	1·7	4
„ more than 250 parasites	2 cases	16 cases (2 with more than 500)

Those in the first category are regarded as carriers only.

The author reiterates that the presence of hookworms is not necessarily evidence of disease and the need to adjust the economics of mass treatment to the criteria of infection. These are discussed and emphasis is placed on the need for education and the introduction of sanitary measures, rather than on unselective mass treatment of all infected persons, irrespective of their clinical conditions. *H. J. O'D. Burke-Gaffney*

CANNAVÒ, L. **New Discoveries in the Clinical Medicine of Ankylostomiasis.** *Panminerva Med.* Turin. 1960, June, v. 2, No. 6, 294–300, 8 figs. [Numerous refs.] [Translation from *Minerva Med.* 1959, v. 50, 4220.]

Increasing study of ankylostomiasis has, it is stated, led to the realization that the disease can cause unusual symptoms but in the majority of cases the outstanding feature is anaemia. Various theories concerning the cause of this anaemia are referred to [although iron balance and iron stores, consideration of which is essential to an understanding of the pathogenesis of these anaemias, are not mentioned], recent work suggesting deficient absorption of iron as the cause of the anaemia is reviewed and such absorptive deficiency is thought to receive support from the hypochlorhydria which is frequent in these patients [it must however, be remembered that those with achlorhydria still absorb significant quantities of iron]. Work is described in which it has been found that there is a correlation between anaemia in ankylostomiasis and hypoalbuminaemia with a relative hypoproteinaemia, both of which are also associated with hypergammaglobulinaemia which it is stated is always found in ankylostomiasis.

Electrocardiographic changes have been found in ankylostomiasis and these are independent of any anaemia which may be present; they are thought to be due to a toxic state which develops when the myocardium lacks iron [evidence for this view is not given].

Early in the course of an ankylostomal infection, it is considered that there is hyperchlorhydria and "a gastroduodenal hyperkinetic syndrome". Later hypochlorhydria or achlorhydria develops and gastro-intestinal motility is impaired.

Chromatographic studies of the gastric juice have shown that in ankylostomiasis there is commonly an absence of glycine in hydrolysates of the gastric juice. Various amino-acids not normally present in healthy persons have also been found in the gastric juice of those with ankylostomiasis.

Liver function tests indicate, it is stated, that the liver is usually involved in this disease [this may be true but it does not follow that the infection causes the liver damage]. A variety of other conditions are attributed to ankylostomiasis although the evidence for so doing appears to be slender. These conditions include jaundice due to inflammation of the ampulla of Vater, haemolytic jaundice, pancreatic dysfunction, "neurophysical disorders", catarrh, pseudo-colds and skin disorders including not only the initial lesions due to penetration of the infective larvae but also allergic or urticarial eruptions similar to those seen in measles and scarlatina. *A. W. Woodruff*

GIGITASHVILI, M. S. & ZIRAKISHVILI, L. M. [**Treatment of Ankylostomiasis Cases with Tetrachlorated Carbon through a Duodenal Tube**] *Med. Parasit. & Parasitic Dis.* Moscow. 1960, v. 29, No. 4, 416–18. [In Russian.]

The English summary appended to the paper is as follows:—

"Under the treatment by the authors were a total of 86 patients afflicted with ancylostomiasis. The curative procedure provided for introduction of CCl_4 in a dose of 2.5 ml into the duodenum via a tube. This brought complete recovery to 93% of the patients. It is the authors' opinion that by administering the preparation directly into the intestine, by-passing the stomach, it is possible to reduce the dose, curtail side-effects and raise the efficacy of the treatment."

LÓPEZ RICO, A., LOYO DÍAZ, Celia & RETOLAZA DÍAZ, Teresa. Terapéutica de la uncinariasis con tetracloretileno emulsionado. [**Treatment of Hookworm Infections with Emulsified Tetrachlorethylene**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, Sept., v. 19, No. 3, 265–70.

The English summary appended to the paper is as follows:—

"The emulsified tetraclorethylene in water [this *Bulletin*, 1960, v. 57, 728, 729], without a purgative, can be used in field work, in the treatment of hookworm infections. In this study, the effectiveness of tetraclorethylene at the dose of 0·15 ml./Kg. weight in a single treatment, was 34.4 per cent, with a percentage reduction of total egg counts of 66.7 and preference attack against median and strong infections with a conversion in weak infection. In associated ascariasis and trichocephaliasis the efficacy response was 21 and 8.5 per cent respectively, with preference in weak infections."

[See also *Bol. Epidemiol.*, 1959, v. 23, 87.]

LÓPEZ RICO, A., LOYO DÍAZ, Celia & RETOLAZA DÍAZ, Teresa. Asociación tetracloretileno-piperazina en tratamiento simultáneo de uncinariasis con ascaridiosis. Estudio de 33 casos. [**Combination of Tetrachlorethylene and Piperazine in the Treatment of 33 Patients with Hookworm and *Ascaris* Infection**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, Dec., v. 19, No. 4, 329–34. [12 refs.]

The English summary appended to the paper is as follows:—

"33 patients infected with hookworm and *Ascaris lumbricoides*, were treated with emulsified tetraclorethylene and piperazine, associated, in a single dose, and without a purgative. 48.5 per cent were cured of hookworm infections and 54.5 per cent of ascariasis. There were no signs of intolerance or toxicity."

HSIEH, Hsien-Chen, CHOW, Lien-Pin & SHIH, Cheng-Chun. **Mass Treatment of Hookworm Infections with Tetrachlorethylene and 1-Bromo-Naphthol-(2) at Two Rural Villages in Southern Taiwan.** *J. Formosan Med. Ass.* 1960, Jan. 28, v. 59, No. 1, 53–9.

Tetrachlorethylene has been widely used in Taiwan since World War II for hookworm infections, but Wormin (1-bromo-2-naphthol) has been found just

as effective and has also been used. The authors give in this paper the results of their tests of these two drugs given by mass treatment, the patients being warned not to take alcohol or fat. Stool examinations were done 2 weeks before and 4–5 weeks after the doses by the Stoll dilution method, flotation on $MgSO_4$ and brine and by larval cultivation.

The doses were: tetrachlorethylene syrup—3 cc. for patients over 15 and 0·2 cc. per year of age for those under 15, all given in water without a purge before or after; Wormin—for adults 6 gm. (4 gm. base) as granules were given at 8 p.m. one day and 6 p.m. [presumably a.m.] the next and for younger patients 1 gm. for ages 2–3 years, 1·5 for ages 4–6, 2 gm. for ages 7–10, 2·5 for ages 11–12 and 3 gm. for ages 13–14, all without a purge before or after the doses.

Tetrachlorethylene was given to 626 patients, of whom only 206 were checked and only 190 of these were infected with hookworms; Wormin was given to 489 patients, of whom only 303 were checked and only 241 were infected. Tables show the results.

Checks by egg flotation and larval culture showed that of the patients given tetrachlorethylene 31 out of 190 (16·31%) were negative after treatment, whereas of the patients given Wormin 93 out of 241 (38·59%) became negative. Reduction of the egg count shown by the Stoll dilution technique showed that Wormin was 43% more effective than tetrachlorethylene. Larval cultivation showed that, in *Ancylostoma* infections, Wormin gave a reduction of the incidence of 52·11%, while tetrachlorethylene gave a reduction of 27·33%; and that, in *Necator* infections, Wormin gave a reduction of 87·5%, while tetrachlorethylene gave a reduction of 40·7%. Thus Wormin was more effective against both these genera.

Side effects (abdominal pain, nausea, dizziness and headache) were shown by 25% of patients given Wormin and by 80% given tetrachorethylene.

G. Lapage

ZAKINE, Jeanne & ZAKINE, C. Essais thérapeutiques dans l'ankylostomose en Tunisie par un dérivé quaternaire de l'ammonium. **[Treatment of Ankylostomiasis in Tunisia with a Quaternary Ammonium Derivative]** *Bull. Soc. Path. Exot.* 1960, Mar.–Apr., v. 53, No. 2, 314–21.

Alcopar, already quite a well-known anthelmintic, appears to be remarkably efficacious in the campaign against ankylostomiasis. The results, here recorded, are from 155 patients followed up at Cape Bon in Tunisia. Thus, in those with about 1,000 eggs per gm. of faecal matter, it was 100% effective, with 1,000—3,000 eggs, 92%, and with 3,000—6,000, 62% effective.

In 43 patients in hospital in Tunis the efficacy was about 93·5% for a single course of 5 gm., as compared with 75% produced by tetrachlorethylene after two courses. Against *Ascaris* it was not quite so specific and there were reductions in the egg-counts of 30 to 70%. There were not sufficient numbers to draw any conclusions in the case of *Trichuris trichiura*. Protozoa and their cysts were not affected by the drug.

It has much to recommend it, notably the simplicity of administration of 5 gm. for adults without any previous preparation and it is, on this account, especially suited for the mass therapy of ankylostomiasis. The absence of toxicity is commented upon as well as the lack of any secondary manifestations.

Purgation is unnecessary. Alcopar can be used for children, pregnant women and patients suffering from severe malnutrition and having an unbalanced electrolytic equilibrium.

Three case histories are given. *Philip Manson-Bahr*

BURKS, J. W. & JUNG, R. C. **A New Type of Water Dermatitis in Louisiana.** *Southern Med. J.* 1960, June, v. 53, No. 6, 716–19, 4 figs.

4 cases of creeping eruption acquired in stagnant marsh water in Southern Louisiana are reported. Presumptive evidence suggests that *Strongyloides myopotami* of the coypu may be the cause. *W. E. Kershaw*

CYWES, S. & KRIGE, H. **Intravenous Cholangiography and Tomography as an Aid in the Diagnosis of Ascariasis of the Biliary Tract.** *South African Med. J.* 1960, June 4, v. 34, No. 23, 478–9, 1 fig. [11 refs.]

The authors, having referred to the literature on *Ascaris lumbricoides* in the common bile-duct, report the case history of a non-European boy aged 2½ years who was admitted to hospital suffering from intermittent upper abdominal colic with vomiting, slight pyrexia, and tenderness in the right upper quadrant of the abdomen. The serum bilirubin level was 1·1 mgm. A clinical diagnosis of roundworm in the common bile-duct was made, and confirmation is claimed as the result of intravenous cholangiography and tomography which showed dye in the common duct but a longitudinal filling defect resulting in a "tram-line" appearance. Medical treatment with a piperazine compound (Entacyl) resulted in symptomatic relief and the evacuation of several roundworms from the bowel a few days later. The authors have seen several young patients in whom symptoms of biliary disease led to investigation in the way described, which they have found suitable for out-patient use. Medical treatment is successful. *S. Bell*

JAYEWARDENE, Gladys, ISMAIL, M. M. & WIJAYARATNAM, Y. **Bephenium Hydroxynaphthoate in Treatment of Ascariasis.** *Brit. Med. J.* 1960, July 23, 268–71, 1 chart.

Previous experience in the use of this drug in the treatment of *Ancylostoma* and *Trichuris* infections has shown that in many patients a concurrent ascariasis is also cleared [this *Bulletin*, 1959, v. 56, 639]. The authors, writing from Ceylon, have carried out clinical trials on 396 subjects, who were mostly children, in order to determine the optimum dose and mode of administration to be employed as a mass treatment measure. They point out that sanitary conditions are such that frequent reinfection is inevitable and for this reason their aim was to find an economical dose sufficient to obtain substantial though not necessarily complete clearance of the worm load and which could be repeated at regular intervals.

The results were assessed according to the following criteria. Initially a modified Stoll count was carried out on all faecal specimens in which ova had been recognized in a direct smear. The follow-up examination was made 4–14 days after treatment. Those subjects whose Stoll count was then in the range 0–200 ova per ml. of faeces were assessed as 100% cleared, while in the remainder the proportionate reduction in egg excretion was expressed as the percentage of the original load, the figure obtained being termed the " percentage clearance ". [A percentage clearance of 80% or more appears to have been the accepted target.]

[In this paper all dosages refer to the amount of base; in order to obtain the weight of the salt the figure must be doubled.]

The minimum effective single dose was shown to be 1·25 gm. and this gave higher rates of clearance in those children who showed higher initial egg counts; worms massed together appeared more susceptible to the action of the drug than did a few worms sparsely separated.

Various preparations of the drug were tested in an effort to minimize vomiting, which proved to be the only adverse side effect. A suspension in a lemon-flavoured sugar solution appeared to be the best form, chocolate coated granules coming next, though younger children, who tended to chew them, often defeated the manufacturer's aim in so coating the bitter drug. The drug proved most effective when given in the early morning before food, or late at night after an early supper. When it seems desirable to give 2 doses of the same size in 1 day, the second should be administered 4 hours after an early mid-day meal. No restriction in diet, and no purgation, are indicated. Worms are passed from 30 minutes to 3 days after treatment; in a few patients worms may be vomited. In a single instance, a child carrying a heavy load of worms which were passed in a single mass showed vascular collapse attributed to abdominal decompression from the emptying of a chronically distended bowel.

[This is an eminently practical article which should be read by those whose duties may involve the mass treatment of a population for helminthiasis.]

J. H. Walters

ABDALLAH, A. & SAIF, M. **Nitrated Aluminium Naphthoate in the Treatment of Ancylostomiasis.** *J. Egyptian Med. Ass.* 1959, v. 42, No. 11, 654–8.

Nitrated aluminium naphthoate is a new compound, slightly soluble in water, and has been suggested as an anthelmintic for ankylostomiasis. Preliminary work on it has been done on the corresponding infection in the cat and the fully active dose was found to be 10 mgm./kgm. body weight.

In the group of patients who submitted to this treatment the whole dose was administered on an empty stomach half an hour before breakfast. Single doses of 100, 200, 300 and 400 mgm. were administered to 10, 14, 6 and 7 patients respectively. The stools of all remained positive without any conspicuous reduction in egg counts 10 days after treatment. Repetition of the course after 10 days was also unsuccessful. No side effects were noted.

More prolonged courses up to 400 mgm. daily for 7 consecutive days were given but the results were little better, and side effects occurred, some of them severe, with the higher doses.

The data showed that though some reduction in ova counts in the stools did occur in some patients treated with smaller doses, the dose of 400 mgm. daily for more than 3 days was most promising, but toxic reactions and severe side effects pointed against its further use. The compound is therefore not recommended for further trial. *Philip Manson-Bahr*

MURRAY, H. M. **The Incidence of *Ascaris* Ova in Pretoria Sludge and their Reduction by Storage (Maturation) in Large Heaps.** *J. & Proc. Inst. Sewage Purification.* 1960, Pt. 3, 337–42. Discussion 342–4.

This paper was presented for discussion at a meeting of the South African Branch of the Institute of Sewage Purification held in Pretoria in September 1959. It contains an interesting account of investigations carried out during the last 10 years on the survival of *Ascaris* ova in sewage at different stages in the purification and disposal processes in Pretoria where some 3,000 ova are present per gallon of raw sewage. About 10 to 12% of the ova "pass over with the settled sewage and, again, 10 to 15% of these latter are found in the humus tank effluent".

The results of investigation are described with numerical tables and the methods used in making the counts are given in an appendix.

Among the conclusions is "it has been shown that storage or maturation of dried digested sludge with moisture contents ranging from 45% to 60% in large heaps for two or more months can reduce the very high counts of viable *Ascaris* ova in Pretoria sludge by as much as 100%". Such complete inactivation was not always obtained and in some cases only 85% to 95% reduction resulted.

These and other findings are discussed, including the laboratory tests of KELLER [this *Bulletin*, 1951, v. 48, 487] in which complete inactivation of *Ascaris* ova was achieved at 55°C. for 2 hours. The question is posed whether the need for 100% safe sludge does not justify the expense and trouble involved and this is compared with the 90% inactivation obtained by the methods described. The alternative implications must be faced. *M. E. Delafield*

OLIVER-GONZÁLEZ, J. **Histopathological and Immunological Observations after Inoculation of Substances isolated from the Muscle and Cuticle of *Ascaris lumbricoides*.** *J. Infect. Dis.* 1960, July–Aug., v. 107, No. 1, 94–9, 7 figs.

A polysaccharide prepared from the muscle of *Ascaris* was injected intraperitoneally into mice. This produced a cellular infiltration in the liver with cells resembling haemopoietic cells including megakaryocytes. Other mice and rats were inoculated intraperitoneally with a substance called "A_2 isoagglutinogen-like substance" (A_2IS) prepared from the cuticle; this substance was absorbed on to tanned human erythrocytes of group O before injection. The organs of the inoculated animals developed a pink hyaline material in the liver, spleen and kidneys. This material seemed to be collagen. It appeared at the second week and gradually increased. The livers also contained masses of

agglutinated and laked erythrocytes. The kidneys showed haemoglobinuric nephrosis. Such changes were not seen in mice inoculated with erythrocytes alone (tanned or not tanned) or with the substance A_2IS alone.

The sera of 55 children with visceral larva migrans and eosinophilia of 32–58% were tested for the agglutination of tanned erythrocytes carrying A_2IS; 76% of them gave positive titres of 1 in 20 to 1 in 5,120. Sera from 32 children without larva migrans but with *Ascaris* in the intestine were also tested; only 2 children (6%) gave positive titres of 1 in 10 and 1 in 20. It is suggested that this A_2IS substance may be responsible for some of the initial hypersensitive conditions which occur in various infectious processes. *F. Hawking*

VAN THIEL, P. H. **Comments on a Case of *Toxocara* Infection in the Netherlands.** *Trop. & Geograph. Med.* Amsterdam. 1960, Mar., v. 12, No. 1, 67–70, 1 fig. [18 refs.]

A young patient with encephalitis in whose brain a nematode larva was found, is believed to be a case of "larval granulomatosis" caused by the larvae of *Toxocara* which could not be given specific identification. *W. E. Kershaw*

MILBURN, C. L., Jr. & ERNST, K. F. **Eosinophilia-Hepatomegaly Syndrome of Infants and Young Children. Report of a Case due to Invasion of Liver by Nematode Larvae.** *Pediatrics.* Springfield, Ill. 1953, Apr., v. 11, No. 4, 358–67, 4 figs. [13 refs.]

SMITH, Margaret H. D. & BEAVER, P. C. **Persistence and Distribution of Toxocara Larvae in the Tissues of Children and Mice.** *Pediatrics.* Springfield, Ill. 1953, Nov., v. 12, No. 5, 491–7, 1 chart. [23 refs.]

PIKE, Eileen H. **Effect of Diethylcarbamazine, Oxophenarsine Hydrochloride and Piperazine Citrate on *Toxocara canis* Larvae in Mice.** *Exper. Parasit.* New York. 1960, June, v. 9, No. 3, 223–32, 2 figs. & 1 pl. [31 refs.]

Visceral larva migrans (due to parasitic nematode larvae in an abnormal host) produces a syndrome which resembles tropical eosinophilia. Accordingly therapeutic studies were made on *Toxocara canis* infections in mice, by means of drugs which have been found beneficial in tropical eosinophilia. To test the effect of drugs on hatching larvae the mice were dosed by stomach tube 1 hour before administration of the infective eggs and for hourly intervals thereafter for 6 doses. The mice were killed and examined 3–10 days after the end of treatment. Other mice were treated intraperitoneally daily for 7 days, beginning 24 hours after infection, so as to test upon migrating larvae.

Piperazine citrate in doses of 50–100 mgm./kgm. by mouth or 300–500 mgm./kgm. intraperitoneally had no effect upon the larvae, compared with untreated control mice. Similarly diethylcarbamazine (Hetrazan) in doses of 10 mgm./kgm. by mouth during the time larvae were hatching had no effect.

On the other hand, mice treated with 25 mgm./kgm. twice daily for 14 days beginning on the 14th day of infection (*i.e.* encapsulated larvae) contained only 40% as many larvae as the controls, but shorter periods of treatment were ineffective. When oxophenarsine hydrochloride 1 mgm./kgm. intraperitoneally weekly for 6 weeks was given there was a slight diminution (to 77%) in the number of larvae compared with the controls. During the period of larval migration, there was eosinophilia in the blood of these mice and it was not significantly affected by either diethylcarbamazine or by oxophenarsine. All the mice showed signs of pneumonia during the phase of lung migration. Apparently none of the drugs had any effect on the *T. canis* larvae during their stay in the intestine and they did not prevent them from invading the tissues; but prolonged treatment with diethylcarbamazine or oxophenarsine killed some of the worms after they had settled down in the tissues. *F. Hawking*

AHMED, S. **Filariasis.** *Brit. J. Clin. Practice.* 1960, Sept., v. 14, No. 9, 697–703, 2 figs. [12 refs.]

The author discusses filariasis in general and tabulates the chief features of the various filarial worms and the endemicity of the infection caused by them. He then reviews the diagnosis, differential diagnosis and treatment and gives 4 illustrative case histories. Case records of 206 patients diagnosed as suffering from filariasis in the Hospital for Tropical Diseases, London, between January 1958 and November 1959 were studied.

The distribution was as follows:—

	Europeans	*Non-White*	*Total*
Proved onchocerciasis	42	6	48
Clinical onchocerciasis	39	2	41
Clinical and proved loiasis	46	13	59
Proved *W. bancrofti*	—	13	13
Clinical *W. bancrofti*	4	28	32
Proved *D. perstans* only	8	2	10
Proved *D. streptocerca*	3	—	3
	142	64	206

[In the original table there is an error in addition in the last column.]

Only 7 of 42 European patients with proved onchocerciasis had no symptoms, but 14 did not have physical signs suggesting this disease. Only 8 of those 42 had keratitis and none showed any significant impairment of vision, which suggests that onchocerciasis is not a blinding disease in Europeans. Only 3 of the European patients with loiasis were free from symptoms, but only 6 showed *L. loa* embryos.

It is noteworthy that *Wuchereria bancrofti* infection was found in only 4 Europeans out of a total of 32 patients, which suggests that the disease rarely occurs in visitors to endemic areas.

It was noted that the higher the eosinophilia the more likely was a complement-fixation test to be positive, though the reverse did not necessarily hold.

The filarial complement-fixation test was more often positive in loiasis [this *Bulletin*, 1956, v. 53, 1464] and was negative in all cases of *Dipetalonema perstans* infections [*ibid.*, 1958, v. 55, 197]. The test was positive in about half the cases of proved onchocerciasis [*ibid.*, 925]. *H. J. O'D Burke-Gaffney*

DIWAN CHAND, SINGH, M. V. & SHRIVASTAVA, R. N. **Note on Filariasis in Hardoi Town, Uttar Pradesh.** *Indian J. Malariology*. 1959, Dec., v. 13, No. 4, 163–73, 1 map.

Hardoi, in Uttar Pradesh, India, is a town of about 30,000 population in which filariasis was considered almost absent until some 10 years ago. Between April and July 1959, house-to-house visits were made at night in different parts of the town, and 1,846 persons were examined for clinical filariasis; thick blood films of 20 cmm. were taken at the same time. Adult mosquitoes were collected between 7.00 and 11.00 a.m., and dissected for filarial infection. The results of these surveys are presented in a series of tables.

Wuchereria bancrofti was the only infection found. The youngest child who showed infection was 2½ years old, and the youngest with disease was 14 years old. The overall infection rate was 10·29%, disease rate was 10·72%, and endemicity rate was 19·82%; the average infection was 13·05 microfilariae per 20 cmm. of blood. Hydrocele and other genital lesions formed over three-quarters of the disease manifestations seen. *Culex fatigans* was the commonest mosquito and provided the only infected specimens. Common breeding places were open house and street drains, tanks and cesspools.

In discussion, the increased incidence of filariasis is attributed to a combination of circumstances. There has been an influx of labourers from known endemic areas of *W. bancrofti* infection; a waterworks was installed about 6 years previously without provision of a proper drainage system; congestion and overcrowding in badly drained areas have led to the multiplication of *Culex fatigans* breeding places. Temperature and humidity are favourable for transmission of filarial infection for 4 to 8 months in the year.

[Tables I and II would have been more useful had the data for males and females been given separately. It is not explained whether "average infestation" refers to all films, or to positive films only. The figure for males in Table III should presumably be 1,325, not 1,324 as printed.] *T. Wilson*

SINHA, A. P., NANDA, D. K., SINGH, M. V. & DIWAN CHAND. **Day and Night Filaria Surveys in some Persons with Periodic *W. bancrofti* before and after Diethylcarbamazine Therapy.** *Indian J. Malariology*. 1959, Dec., v. 13, No. 4, 159–62, ¼ graph.

This investigation was carried out in an area of Uttar Pradesh, India, where filariasis due to periodic *Wuchereria bancrofti* transmitted by *Culex fatigans* is endemic. The object was to compare day-time with night-time microfilaria rates in the same persons, and to observe whether a reported reversal of periodicity after diethylcarbamazine treatment could be confirmed.

About 20 cmm. of blood were obtained by finger-prick from persons of each

sex and all ages, between 10 a.m. and 1 p.m. for the day-time survey, and between 9 p.m. and midnight for the night-time survey. "Thereafter, a five days' course of diethylcarbamazine was administered in a dose of 4 mg./kg. of body weight" and the day/night surveys were then repeated.

The results are tabulated and charted by age-groups. Before treatment the day-time microfilaria rate was 4·2% (35 out of 854), the night-time rate was 11·7% (100 out of 854); after treatment, these rates were reduced to 0·46% (4 out of 854) and 2·22% (19 out of 854) respectively. It is concluded that night surveys are essential in order to obtain as true a picture as possible of the positives in periodic *W. bancrofti* areas, and that diethylcarbamazine treatment considerably reduces the number of positive films but does not produce a change in periodicity.

[In Table II and in the text it is stated that no positives were found in the 41–50 years age-group after treatment, yet the chart shows a post-treatment night survey microfilaria rate of about 9% for that group. The text mentions that complete data were available for 857 persons, but the total in the tables is 854. Microfilariae are said to have been counted in positive films, but no counts are given; it would be of interest to know whether positive day-time films were associated with high night-time counts.] *T. Wilson*

El-Tamami, M. Y. **Effect of the Changed Habits of Life during the Fasting Month of Ramadan, and of Treatment, on the Periodicity of Bancroftian Microfilaria in Rosetta, Egypt.** *J. Egyptian Med. Ass.* 1960, v. 43, No. 4, 152–63, 2 figs.

Microfilarial counts were made every 2 hours on 5 adult persons with *Wuchereria bancrofti*, the results were averaged and the usual periodicity curve was obtained with a peak at about 1.00 a.m. After 20 days of the feast of Ramadan (during which the habits of people are much changed, *e.g.* people stay awake later in the evening and sleep more in the day, and they fast during the day), the curves were obtained again. In most of the cases there was a delay of about 4 hours in the onset of the microfilaria-free period in the morning, and an evening extension of this free period by 2–4 hours. The rise in the count occurred more slowly and reached slightly lower peak at about 7.00 a.m. In another group of 22 persons the microfilarial count was taken at 11.00 p.m. during Ramadan and again a month later. In 17 of the 22 cases the count in Ramadan was from 0·25 to 0·74 of that of the normal month (presumably because the curve was shifted to a later period and perhaps the actual height was lower). 2 other patients were treated with diethylcarbamazine and their blood was examined at 10.00 p.m. and 10.00 a.m. for 8 days. The night count fell to zero [as was expected] but there was no compensatory increase in the day count [which would not have been expected]. *F. Hawking*

Krishnaswami, A. K., Pattanayak, S. & Raghavan, N. G. S. **The Susceptibility of *Culex fatigans* to Different Densities of *Mf. bancrofti*.** *Indian J. Malariology.* 1959, Dec., v. 13, No. 4, 153–7, 1 graph. [12 refs.]

Females of *Culex fatigans* were fed on human volunteers carrying 0, 1–10, 11–50, 51–100, 101–150 and 210–220 microfilariae of *Wuchereria bancrofti* per

20 cmm. of peripheral blood. The percentages of mosquitoes found to be infected on dissection were respectively, 20·0, 21·9, 82·2, 96·8, 98·8 and 85·7. The average number of filariae per mosquito was respectively 3·0, 3·55, 7·1, 5·65, 28·8 and 25·8. These results are from batches of over 80 fed mosquitoes, except for the first result (0 microfilariae) when only 10 mosquitoes were dissected, and the last result (210–220 microfilariae) when 28 mosquitoes were dissected. Although 10 mosquitoes were fed on volunteers not showing infection, 2 of the mosquitoes became infected.

The average number of infective larvae per mosquito for each microfilarial density is also given, and fewer infective larvae were produced by mosquitoes fed on volunteers with the higher densities, more than 100 microfilariae/20 cmm. of blood, than by those fed on volunteers with 11–100 microfilariae/20 cmm. of blood. This is used to calculate the transmission potential at the different microfilarial densities. There is no record of mosquito survival and the number of mosquitoes surviving to the infective stage is not given.

[It is a great pity that the authors and the editor did not use WHARTON's paper on the transmission of *W. malayi* by *Mansonia longipalpis* as a guide for the presentation of these data, see this *Bulletin*, 1958, v. 55, 795.] *B. R. Laurence*

CASTELLANI, A. **Elephantiasis Nostra and Elephantiasis Tropica: a Comparative Study.** *J. Trop. Med. & Hyg.* 1960, Sept., v. 63, No. 9, 216–21, 4 figs.

The following classification of elephantiasis has been adopted in this paper:—

(1) Elephantiasis tropica, believed to be due to *Wuchereria bancrofti, W.* [*Brugia*] *malayi* and *W. bancrofti* var. *pacifica*;

(2) Elephantiasis nostra or elephantiasis of the temperate zone, of bacterial origin;

(3) Elephantiasis symptomatica or pseudo-elephantiasis caused by syphilis, yaws, tuberculosis, mycosis, or of neoplastic, postoperative or other origin, producing blockage of the lymphatics;

(4) Elephantiasis congenita or Milroy or Meige's disease.

After discussing the familiar evolution of elephantiasis nostra the author remarks that the skin may remain smooth or rough, while the regions of the body affected may be the same as in the tropical form, the most common situation being the lower limbs. The scrotum is affected fairly frequently.

In long standing cases osteo-periostitic lesions together with osteoporosis and occasionally slight deformity of the tibia and fibula occur.

In the author's experience the symptomatology of elephantiasis tropica is identical with that of elephantiasis nostra.

In investigations he has concentrated on lymphatic vesicles and nodules and on the aspirated gland juice.

In 1934 [*J. Trop. Med. & Hyg.*, 1934, v. 37, 257; this *Bulletin*, 1935, v. 32 (279)] he isolated the *Streptococcus metamyceticus* which is Gram-negative on isolation, becoming later Gram-positive. This seems to be a delicate organism and the author thinks that it differs biologically from other streptococci. Vaccines prepared from this organism give remarkable results in the treatment of recurring lymphangitis and elephantiasis nostra ("*presque miraculeux*"). He does not claim that this organism is proved to be the causal agent. In the

pathology the chief anatomical feature is the gross dilatation of certain lymphatics. He thinks also that the pathology of elephantiasis tropica is the same as in elephantiasis nostra, but the complete blockage of lymphatic trunks by adult worms (*W. bancrofti*) is rare. For complete blockage inflammatory processes are necessary.

In the treatment of elephantiasis nostra only vaccines of *S. metamyceticus* are of any avail; as a rule, within 6 months, pyrexial lymphangitic attacks become gradually less frequent and severe. 3 illustrative cases are cited. Among palliative measures, crepe bandages or elastic stockings find a place, but elastic stockings should never be employed during pyrexial periods.

For the treatment of filarial elephantiasis the author still advocates the bandaging with crepe bandages and three times weekly injections of fibrolysin Merck, 2–4 cc. After 2 to 3 months' treatment the limb may appear almost normal. Elongated, ovoid strips of redundant skin may then be excised and the margins sewn up.

Finally he puts forward the view that elephantiasis nostra and elephantiasis tropica are essentially the same disease; a bacterial infection which is primary in temperate zones, but in the tropics usually secondary to a filarial infection, and he suggests that the most suitable treatment for this also would be injections of his vaccines of *S. metamyceticus.*

[Incidentally Castellani throws cold water over the modern conception of the aetiology of tropical elephantiasis and the part that the pathogenic filariae play in it.] *Philip Manson-Bahr*

DUKE, B. O. L. **Studies on Loiasis in Monkeys. III. The Pathology of the Spleen in Drills** (*Mandrillus leucophaeus*) **infected with** *Loa*. *Ann. Trop. Med. & Parasit.* 1960, June, v. 54, No. 2, 141–6, 10 figs. on 2 pls.

In a previous paper [this *Bulletin*, 1960, v. 57, 931] the author described how the microfilariae of *Loa* in drills are destroyed by the spleen, so that the number in the blood is suppressed to a low level. The present paper describes the histological appearances in the spleens of 20 monkeys. Macroscopically small nodules occur in the red pulp of the spleen, especially along its borders. They begin to be formed when microfilariae first appear in the blood and they increase in size and number during the next 18 months. At first they are about 2 mm. in diameter, later they measure 5–15 mm. across and they may become confluent. Those near the surface of the spleen are often crater-shaped. On section they are dark red and richly supplied with blood. Microscopically the nodules originate in the red pulp immediately below the capsule. A spherical honeycomb of fine reticulin fibrils is formed which may compress the adjacent red pulp, but no fibrous capsule is formed. On the reticulin framework there are reticulin cells and many macrophages; in the spaces there are blood cells of all sorts and many eosinophils. There are also multinucleate giant cells, many of which contain disintegrating microfilariae. If the microfilariae in the blood are destroyed by diethylcarbamazine (during which they are engulfed by large phagocytes in the liver, not in the spleen) the nodules in the spleen gradually resolve and disappear during the next 6 months. The active destruction of microfilariae of *Loa* by the spleen in drills seems to be peculiar to these parasites and hosts. It is not obvious in man infected with *Loa*.

[Similarly these changes in the spleen are not conspicuous in monkeys or dogs infected with *Dirofilaria.*

This interesting paper should be consulted in the original by those concerned with filarial infections.] *F. Hawking*

TAYLOR, Angela E. R. **The Development of *Dirofilaria immitis* in the Mosquito *Aedes aegypti*.** *J. Helminthology.* 1960, v. 34, Nos. 1/2, 27–38, 7 text figs. & 3 figs. on pl. [23 refs.]

GRENIER, P., OVAZZA, M. & VALADE, M. Notes biologiques et faunistiques sur *S. damnosum* et les Simuliidae d'Afrique occidentale (Haute-Volta, Côte d'Ivoire, Dahomey, Soudan). [**Biological Notes on *Simulium damnosum* and Simuliids of Upper Volta, Ivory Coast, Dahomey and Sudan**] *Bull. Inst. Français d'Afrique Noire.* Sér. A. 1960, July, v. 22, No. 3, 892–918, 1 fig. [24 refs.]

This paper records observations on the biology of some of the 21 species and varieties of *Simulium* known from French West Africa, and there are also a number of observations on the published literature relating to this genus.

The major part of the section on the biology of *S. damnosum* is concerned with a discussion of the survival of this species over the dry season, and there is also a short description of the type of habitat in which the larvae of this species are found. *B. R. Laurence*

GRENIER, P. & FERAUD, L. Les larves à tubercules dorsaux chez les simulies (*S. damnosum* Théo.; *S. (?) varicorne* Edw.; *S. maculatum* Meig.). [**Larvae with Dorsal Protuberances in *Simulium damnosum*, *S. varicorne* and *S. maculatum***] *Bull. Soc. Path. Exot.* 1960, Mar.–Apr., v. 53, No. 2, 332–8, 2 figs. (1 on pl.)

Only 3 species of *Simulium* have larvae distinguished by dorsal or latero-dorsal protuberances: *S. varicorne* (oriental region), *S. maculatum* (palearctic) and *S. damnosum* (ethiopian). *S. damnosum* is, of course, important as the vector of onchocerciasis in Africa and the rapid identification of the larvae in the field is of great value in planning control measures. The authors claim that the dorso-lateral protuberances on the first 6 abdominal segments will permit this. They claim that they are always present and well developed in the last (7th) larval stage and less developed in the 6th. (FREEMAN and DE MEILLON in *Simuliidae of the Ethiopian Region* [this *Bulletin*, 1954, v. 51, 323], however, state " segments sometimes rather protuberant laterally, but not invariably so ".)

Other characteristics of *S. damnosum* larvae are the shape of the occipital cleft (figured) and the covering of small spatulate scales (from the 4th stage onwards) appearing first on the posterior parts of the dorsal segments and gradually extending to cover the entire body. *J. R. Busvine*

See also p. 141, LEWIS *et al.*, **Attachment of Immature Simuliidae to other Arthropods.**

BROWNE, S. G. **The Role of *Onchocerca volvulus* in Lymphadenopathy and Associated Conditions.** *Central African J. of Med.* 1960, July, v. 6, No. 7, 302–6, 4 figs. [32 refs.]

The role of *Onchocerca volvulus* in the aetiology of lymphadenopathy, elephantiasis, hydrocele and orchitis has been a disputed matter since the days of OUZILLEAU [this *Bulletin*, 1913, v. 2, 426; 1914, v. 3, 104]. At first elephantiasis of the genitalia and adjacent tissues was attributed to onchocercal microfilariae, so that Dyce SHARP [*ibid.*, 1926, v. 23, 761] suspected that they were the cause of these phenomena, but subsequently LAIGRET [*ibid.*, 1930, v. 27, 992] in Africa and MARTÍNEZ-BÁEZ [*ibid.*, 1935, v. 32, 649] in Central America, cast doubts upon this theory, both on clinical and pathological grounds. KIRK [*ibid.*, 1948, v. 45, 531] recorded that hydrocele and elephantiasis of the genitalia were extremely common in the southern Sudan in districts of high onchocercal endemicity, but FAIN [*ibid.*, 1948, v. 45, 100] found the embryos of *Wuchereria bancrofti* (not *O. volvulus*) in aspirated fluid from similar lesions in the Belgian Congo.

The chronic enlarged inguinal glands in onchocerciasis have been found to contain onchocercal microfilariae since the days of Ouzilleau in 1913. The evidence from South American foci suggests that adenopathy may accompany onchocerciasis, but that it is less in incidence and degree than in African cases. Opinions differ concerning the mechanisms producing the changes in the lymphatic glands and subcutaneous tissues. Adult worms, microfilariae, toxins arising from adult worms and even *Simulium* saliva inoculated repeatedly into the drainage area of the glands, have all been suggested at one time or other.

The present study was undertaken in the Oriental Province of the Congo [this *Bulletin*, 1960, v. 57, 622] where the main foci of onchocerciasis were exempt from *W. bancrofti* infection. There, two-thirds of the adult males and almost one-third of the females, had palpable inguinal and crural lymphatic glands.

In the villages of high onchocercal endemicity greater degrees of glandular enlargement were of frequent occurrence. In the areas exempt from *W. bancrofti* infection 30% of onchocerciasis patients had more than minimal degrees of chronic inguino-crural lymphatic enlargement. The greater the enlargement and the greater the matting together of the glands, the greater the likelihood of coexisting onchocerciasis. All the cases of "hanging groin" certainly had it.

The more severe the manifestations in the individual patient the greater the degree of inguino-crural lymphadenopathy. The axillary glands were much less frequently the seat of similar changes. The virtual absence of lymph stasis was confirmed.

Masses of inguino-crural glands of 54 adults suffering from more or less severe onchocerciasis and from advanced degrees of sclerosis including "hanging groin" were each aspirated with a wide-bore needle and the material stained with Delafield's haematoxylin. Microfilariae were found in 35 persons: *O. volvulus* in 7, *Loa loa* in 26, *Dipetalonema perstans* in 4; 2 had both *L. loa* and *D. perstans*, but no *W. bancrofti* were seen.

If onchocercal microfilariae are directly or indirectly responsible for the pathological changes in the glands, they should be found there, but the present findings suggest that it is more probable that they are due to *Loa loa*. But if the changes, as suggested in RODHAIN [*Inst. Roy. Col. Belge*, 1952, v. 21, 5] or SHAFI MOHAMMED [this *Bulletin*, 1932, v. 29, 85], are anaphylactic in nature

and related to a toxin from onchocercal microfilariae or adults, then the discovery of *O. volvulus* and *L. loa* in the gland substance is irrelevant.

These converging lines of evidence indicate that in the district investigated there is a definite association between sclerosing hypertrophic lymphadenopathy of the inguino-crural glands, and the results of onchocerciasis or *Simulium* bites.

No cases of elephantiasis of the typical *W. bancrofti* type were observed in the foci of high onchocercal endemicity, but from other evidence it is suggested that examples in the scrotum, breast and leg may occasionally result. However, in onchocercal foci thickening of the scrotal skin reminiscent of early *W. bancrofti* elephantiasis, but more superficially situated, may be noted. The associated inguino-crural glands showed the sclerotic hypertrophic changes described and the skin of the back, the buttocks and the thighs presented advanced onchodermatitic changes.

Minimal elephantoid changes were found in 157 patients in the scrotum, 11 in the penis and 4 in the labia.

A complete investigation of the adult male population for the presence of hydrocele provided no evidence of the aetiological role of onchocerciasis.

Apart from the very rare presence of onchocercomata in the body of the testes, the diagnosis of onchocercal involvement of the organ is vitiated by a lack of precise clinical criteria. So it was impossible to detect any difference between districts of high onchocercal endemicity and others in the matter of testicular pathology. *Philip Manson-Bahr*

MARSDEN, A. T. H. **Report of a Nematode Worm, probably *Enterobius vermicularis*, in the Prostate.** *Med. J. Malaya.* 1960, Mar., v. 14, No. 3, 187–90, 2 figs.

Prostatic infection by worms is rare and the first such infection by *Enterobius vermicularis* was reported by SYMMERS [this *Bulletin*, 1957, v. 54, 1218]. The present author, from the Institute of Medical Research, Kuala Lumpur, records the presence of a worm, probably *E. vermicularis*, in an enlarged prostate removed from a Chinese aged 60. There was typical nodular hyperplasia and some cellular infiltration of the glandular areas. Fragments of a disintegrated round worm were found in a few glands. The larger fragments were in grossly dilated glands, some showing squamous metaplasia, and the smaller fragments were closely surrounded by the glands: in these the epithelium was largely lost and the worm was in direct contact with fibrous tissue. Above the fragments the gland was collapsed and below there was some epithelial hyperplasia. Inflammatory infiltration was significant only around the collapsed glands, the worm remnants excited little reaction and there was no eosinophil infiltration.

Serial sections suggested that at least 7 worms had been present. All were dead and disintegrated and only insoluble fragments remained; the smaller fragments were calcifying and the others had mostly lost their structure, but in some cases remains of the cuticle and muscle coat could be identified. The internal organs could not be identified and no eggs were seen. The microscopic appearances are shown in two illustrations.

The author discusses why so prevalent a worm, the female of which has wandering habits, should be found so rarely in the prostate. He concludes

that either the urinary tract is difficult to penetrate or that its environment is unfavourable for the worms.

He also discusses the tissue reaction in relation to the state of the worm. It is typically an epithelial hyperplasia while the worm is alive, and an allergic reaction to absorbed soluble products of disintegration after its death. The insoluble remnants excite a foreign body reaction if they are in the tissues, with eventual encapsulation and calcification, and little or no reaction if they are in a gland, other than epithelial atrophy and direct enclosure by fibrous tissue. *H. J. O'D. Burke-Gaffney*

SANDERS, A. I. & HALL, W. H. **Comparison of Dithiazanine Iodide and Pyrvinium Pamoate in the Treatment of Enterobiasis (Pinworms).** *J. Lab. & Clin. Med.* 1960, Sept., v. 56, No. 3, 413–16.

109 children were examined and 38 were found infected with threadworms. In addition, 10 other children and 6 adults who had these parasites were treated.

Dithiazanine iodide was given either in plain or enteric coated tablets containing 25 mgm. of the drug. The daily dosage was 5 mgm. per pound body weight, not exceeding 600 mgm. The daily dosage was divided into 2 or 3 doses and given for 5 days.

Uncoated tablets of dithiazanine iodide when given to children caused vomiting in 9 of 11 and were discontinued. Enteric coated tablets were given to 12 children ranging in age from 4 to 13 years, in weight from 32 to 96 pounds. 4 vomited and treatment was discontinued. The 6 children who completed the treatment were all freed of threadworm ova. The coated tablets were also given to 2 adults. One had vomiting and diarrhoea; the other completed the course and was cured.

25 children and 4 adults were treated with pyrvinium pamoate [this *Bulletin*, 1960, v. 57, 162]. One child vomited two hours after administration of the drug, which was discontinued. The two post-treatment examinations did not reveal threadworm ova in any of the 28 subjects who completed treatment.

This drug was given as a raspberry flavoured syrup which contained 10 mgm. of pyrvinium per ml. A single dose of 5 ml. per 20 pounds body weight was given before breakfast. The search for threadworm ova was made 7 and 21 days after treatment. *Philip Manson-Bahr*

TAILYOUR, Joan M. & STEELE, J. R. *Trichinella* **Infection in Swine in the Vancouver Area.** *Canadian J. Pub. Health.* 1960, Aug., v. 51, No. 8, 309.

"The diaphragms of all hogs passing through the Vancouver City Meat Inspection Depot for a total period of 4 weeks during the fall of 1959, were examined for *Trichinella spiralis* larvae. Two animals from two establishments were positive, the incidence of infection in one case being 1·4% and in the other 3·9%."

[See this *Bulletin*, 1950, v. 47, 71.]

KATZ, F. F. **The Oral Transplantation of Intestinal Stages of** *Trichinella spiralis*. *J. Parasitology*. 1960, Aug., v. 46, No. 4, 500–504. [13 refs.]

"1. A study has been carried out to determine at what time in the intestinal phase *Trichinella spiralis* can be transplanted from one mouse to another per os.

"2. Muscle infections were obtained in all mice fed 5-hour worms. These infections were comparable to those in control animals.

"3. Neither intestinal nor muscle infections were demonstrated for worms transplanted 24 or 28 hours beyond the infective muscle stage.

"4. Muscle larvae were recovered from the majority of mice inoculated with 48-, 52-, or 72-hour intestinal trichinae. Although transplanted worms were recovered from the small intestines of some mice of these time intervals, a correlation could not be made between the intestinal and muscle infections.

"5. It is suggested that some of the 72-hour intestinal females may have deposited larvae without becoming established in the intestinal mucosa of the receptor mice.

"6. The results of the experiments reported may be of epidemiologic importance."

[These findings may prove of more than academic interest; see ZIMMERMANN *et al.*, this *Bulletin*, 1959, v. 56, 1268]

DEFICIENCY DISEASES

WADSWORTH, G. R. & LEE, T. S. **The Height, Weight and Skinfold Thickness of Muar Schoolchildren.** *J. Trop. Pediatrics*. London. 1960, Sept., v. 6, No. 2, 48–54, 7 figs.

The height and weight of 280 boys and 190 girls and skin-fold measurements of 279 of these boys and 179 of the girls were measured in 6 schools in the Muar Rural Health District on the south-west coast of Malaya. The children's parents were from lower income groups, mostly rubber tappers and some farmers. Skin-fold measurements were made with a Medical Research Council caliper by one observer, at the six sites described by HAMMOND [*Brit. J. Preventive & Social Med.*, 1955, v. 9, 201].

Tables show the mean heights, weights and skin-fold thickness related to ages of boys and girls. An analysis is made of the relationship between mean heights and weights of different age-groups in comparison with measurements of London schoolchildren. The weight of surface body fat for each sex and age-group was estimated by calculating the mean fat-thickness from skin-fold measurements, and multiplying this by the surface area of the body as computed by the Dubois formula. A table gives these calculations and expresses the weight of surface fat as a percentage of body weight, ranging for boys from 2·98 kgm. of surface fat or 16·7% body weight at 7 years to 5·90 kgm. or

18·1% at 14 years, and for girls, from 3·17 kgm. or 19·3% at 6 years to 7·14 kgm. or 23·8% at 12 years.

The results show that Muar boys and girls were considerably smaller and lighter for their age than London schoolchildren, but that the relationships of weight to height were much the same. In childhood body fat normally represents 22 to 28% of the body weight, and if an observed distribution of fat in adult men (95% body fat = surface fat) applies to children, these Malayan children were not unduly thin, which agrees with the height/weight relationship.

Discussing these observations, the authors note that in the absence of clinical signs of malnutrition, growth of children provides one of the best objective means of assessing nutritional status, but ideal standards of optimal weight and height are open to question, partly because an increasing number of English children may be excessively heavy, so providing a false standard; partly because of the influence of race and genetic factors on physique. There is evidence that environmental may be more important than racial factors. The smallness of the Malayan children, compared with English children, may be due to difficulties in finding sufficient food during the war and "emergency", and (as they assist their parents in rubber-tapping, and have to walk many miles each day) their caloric requirements may be greater.

The results of a haemoglobin survey in these children have been reported previously [this *Bulletin*, 1960, v. 57, 514]. *T. P. Eddy*

Plough, I. C. & Bridgforth, E. B. **Relations of Clinical and Dietary Findings in Nutrition Surveys.** *Pub. Health Rep.* Wash. 1960, Aug., v. 75, No. 8, 699–706, 9 figs.

This paper attempts to correlate a number of biochemical and clinical findings recorded in 58 nutrition surveys carried out under the auspices of the U.S. Interdepartmental Committee on Nutrition for National Defence in 8 countries. No correlations were noted between calorie intake and height, weight and skin-fold thickness. The dietary intake of vitamin C correlated well with the incidence of swollen and bleeding gums and also with the plasma level. There were no correlations between dietary thiamine intake, urinary thiamine excretion and absent ankle jerks or calf tenderness. No clinical findings could be correlated with riboflavine intake. Dietary intake of vitamin A was not correlated with the incidence of follicular keratosis or Bitot's spots or with the serum levels of the vitamins and carotene.

[These results are discussed at some length: see also this *Bulletin*, 1960, v. 57, 164.] *R. Passmore*

Darby, W. J., McGanity, W. J., McLaren, D. S., Paton, D., Alemu, A. Z. & Medhen, A. M. G. **Bitot's Spots and Vitamin A Deficiency.** *Pub. Health Rep.* Wash. 1960, Aug., v. 75, No. 8, 738–43, 1 fig. [19 refs.]

This paper reviews studies on the epidemiology of Bitot's spots in Ethiopia and Tanganyika. No correlation was found between the presence of Bitot's spots and such undisputed signs of vitamin A deficiency as night blindness

and keratomalacia, nor with the serum levels of vitamin A and carotene. It is concluded that the presence of the spots is not a sign of a specific deficiency and " the nutritional significance of the lesion must be evaluated in conjunction with other evidence ". *R. Passmore*

DANCASTER, C. P. & JACKSON, W. P. U. **Studies in Rickets in the Cape Peninsula. I. Cranial Softening in a Coloured Population and its Relationship to the Radiological and Biochemical Changes of Rickets.** *South African Med. J.* 1960, Sept. 10, v. 34, No. 37, 776–80, 1 fig. [18 refs.]

Rickets has been reported recently in Israel [this *Bulletin*, 1958, v. 55, 1153], the Philippines [*ibid.*, 1153], Nigeria [*ibid.*, 1951, v. 48, 1140], Singapore [*Bull. Hyg.*, 1946, v. 21, 604] and South Africa, and occurs frequently in tropical and subtropical countries. Early diagnosis is difficult; in the absence of histological evidence, cases must be assessed by clinical, radiological and biochemical changes. Radiological changes probably occur only when rickets is fairly advanced, and craniotabes has been cited as the earliest clinical sign. An investigation was therefore undertaken at the Groote Schuur Hospital, Cape Town, to determine the incidence of rickets in a hospital population of urbanized coloured out-patients; to assess the frequency and significance of craniotabes between the ages of 3 months and 1 year; and to investigate the value of altered serum levels of alkaline phosphatase, phosphorus, and calcium in diagnosing early rickets, and in assessing progress. Radiographs of the wrist were obtained in all cases, and chest films in many. These films were examined by at least 4 observers (3 of whom saw all the films). They were classified as showing advanced, early, or no rickets and dubious rickets.

105 children were examined for cranial softening, which was graded as mild or severe. The incidence in 53 children aged 3–6 months was 75%, in 25% it was severe; in 52 children aged 7–12 months it was 27% and in 4% it was severe. Of a total of 55 patients with cranial softening, 27 (50%) had radiological evidence of rickets. Patients with severe softening were no more liable to rickets than those with mild softening.

In a control group of children without cranial softening, none of 13 aged 3–6 months, and 5 of 14 aged 7–12 months had radiological rickets.

Observed values of serum alkaline phosphatase (AP) and serum inorganic phosphorus (IP) for children selected at random from cases found with cranial softening, and of a control group without softening, are recorded in a table, classified into five groups. The mean values of these observations and their standard deviations (shown in brackets) were:— controls, AP = 12 (3·9) Sinowara-Bodansky units, IP = 5·8 (0·6) mgm./100 ml.; cranial softening—normal radiological appearance, AP = 18 (6·1), IP = 5·4 (0·7); dubious rickets, AP = 16 (5·1), IP = 5·8 (1·2); early rickets, AP = 27 (13·4), IP = 4·4 (1·5); radiologically advanced rickets, AP = 42 (26·6), IP = 3·8 (1·1).

The difference in mean alkaline phosphatase levels between patients with definite rickets and those with dubious or no rickets was significant ($P<·001$); there was no significant difference between patients with dubious rickets, cranial softening with no rickets, and controls without cranial softening; the difference in means between advanced and early rickets was possibly significant ($P<·05$).

Though the mean inorganic phosphorus values fell progressively with the classifications of increasing rickets, the differences of means in this series were not significant.

Half the patients with radiological rickets had a serum calcium below 9 mgm. per 100 ml. Some patients with rickets had normal alkaline phosphatase and inorganic phosphorus readings, others without radiological abnormality had raised alkaline phosphatase. There was no correlation between biochemical changes and the severity of cranial softening.

On re-examination of 23 patients with rickets 4 weeks after first examination, 8 had received 1 cc. of calciferol (=600,000 units vitamin D) intramuscularly, the remainder were untreated; 11 patients showed radiological improvement, 7 of whom had been treated; no change was noted in 7 patients, one of whom had been treated; radiological appearances were worse in 5, none of whom had been treated. Radiological rickets did not develop in any untreated patient with cranial softening who had had normal X-ray appearances. Of 8 patients with doubtful radiological signs, in 1 patient signs of rickets developed; in 3 patients signs remained doubtful; in 4 patients, 1 of whom received calciferol, appearances became normal.

33 patients with cranial softening were re-examined 4–8 weeks after first examination. 22 had rickets, and of these patients cranial softening was still present and had not changed in 18, though in some the rickets had healed radiologically. The remaining 11 did not have rickets, and on re-examination cranial softening was not detected in 6 of them, and had improved in 2.

Serum re-examinations of 17 patients for alkaline phosphatase (AP), and of 20 patients for inorganic phosphorus (IP) and the values compared with those of original examinations are recorded in tables, and classified according to the radiological appearances on first and second examination as: (A) Radiological rickets; *Improved*—AP rose in 2, fell in 2, IP rose in 2, unchanged in 2; *No change*—AP fell in 1, unchanged in 1, IP rose in 1, unchanged in 1; *Worse*—AP rose in 2, IP slightly lowered in 2. (B) No radiological rickets, *No change*—AP rose in 4, fell in 1, was unchanged in 4, IP rose in 9 cases, fell slightly in 3 and in no case was it below 4·5 mgm. per 100 ml.

Appreciable degrees of cranial softening were very common, and rickets was extremely common, being certainly over 30% and possibly as high as 80% in the group surveyed. Cranial softening is a variable sign in different places, being rare in rickets in Nigeria and Singapore, but common in Cape Town. It can certainly occur without rickets, it does not necessarily lead to rickets, and does not disappear when rickets heals. There appear to be 2 varieties: one completely unassociated with rickets and possibly physiological; the other an identical softening which is associated with rickets.

Radiological evidence of rickets, though probably indicative of relatively advanced rickets, is the most reliable criterion for diagnosis, and of progress. The patients who present the most difficult diagnostic problems are those with dubious radiological appearances, but the biochemical changes were no help as there was no correlation between biochemical abnormality and future progress, while there were considerable variations of serial observations in patients showing no radiological changes. That cranial softening or biochemical changes precede radiological abnormalities has not been demonstrated. *T. P. Eddy*

MISRA, S. M. **The Burning Feet Syndrome. (A Study of 200 Cases.)** *Indian Practitioner*. 1957, Oct., v. 10, No. 10, 925–32. [10 refs.]

An account of 200 cases, with dramatic response to calcium panthothenate.

KRUIEN, P. P., NARAYANARAO, M., SWAMINATHAN, M. & SUBRAHMANYAN, V. **The Metabolism of Nitrogen, Calcium and Phosphorus in Undernourished Children. 6. The Effect of Partial or Complete Replacement of Rice in Poor Vegetarian Diets by Kaffir Corn** (*Sorghum vulgare*). *Brit. J. Nutrition*. 1960, v. 14, No. 3, 339–45. [15 refs.]

"1. The effect on the metabolism of nitrogen, calcium and phosphorus of replacing 25%, 50% or all of the rice in a poor Indian diet by kaffir corn was studied in seven boys aged 10–11 years.

"2. The daily intake of N was nearly the same (equivalent to about 40–43 g protein) with all the diets.

"3. The apparent digestibility coefficients of the protein and the mean daily N retentions diminished as the proportion of kaffir corn in the diet was increased. All the subjects were in positive N balance.

"4. Although the addition of kaffir corn led to a higher Ca intake, the amount of Ca retained decreased as the proportion of kaffir corn in the diet was increased.

"5. Kaffir corn also provided a higher P intake, which resulted in a higher P retention."

SCRIMSHAW, N. S., WILSON, Dorothy & BRESSANI, R. **Infection and Kwashiorkor.** *J. Trop. Pediatrics*. London. 1960, Sept., v. 6, No. 2, 37–43. [Numerous refs.]

"In the technically underdeveloped areas in which infant and child mortality is particularly high, infection and protein malnutrition combine synergistically to produce a net effect far more severe in its consequences than would result from either the protein malnutrition or the infection occurring alone in the individual or the population. Infection tends to precipitate kwashiorkor by resulting in a decreased food and hence nitrogen intake and increased nitrogen loss in the urine. Furthermore, children with protein malnutrition tend to have more frequent infections and these often prove fatal.

"Clinicians and public health workers should recognize that the problem of elevated infant and pre-school mortality must be attacked by programmes designed to combat both protein malnutrition and infection. A programme to control only one of these two factors will always be incomplete and much less effective than when preventive efforts take both into account."

KULKARNI, B. S., SATOSKAR, R. S. & CHITRE, R. G. **Electrophoretic Studies of the Serum Proteins in Protein Malnutrition.** *Indian J. Med. Res.* 1960, July, v. 48, No. 4, 488–94. [25 refs.]

In malnourished children, the alpha 1 and gamma globulins were increased; the beta globulin and albumin were decreased, their fall corresponding with

the severity of the malnutrition. In those patients who died the level of all fractions was decreased, but in the presence of active liver damage, the gamma globulin rose. This state of affairs is compared with that in infantile cirrhosis, where much higher values of gamma globulin are found. Probably this increase depends not only on the severity of the liver damage, but also on its duration.

Alan B. Raper

EDOZIEN, J. C. & UDEOZO, I. O. K. **Serum Copper, Iron and Iron Binding Capacity in Kwashiorkor.** *J. Trop. Pediatrics.* London. 1960, Sept., v. 6, No. 2, 60–64, 2 figs. [29 refs.]

Kwashiorkor is predominantly a protein deficiency; one of the important attributes of serum protein is its iron binding capacity; one would therefore expect the serum iron in kwashiorkor to be low. The present investigation from University College, Ibadan, Nigeria, demonstrates, however, that though the serum iron is low in kwashiorkor, the serum iron binding capacity is not usually completely saturated. This suggests that there is also a genuine iron deficiency in children with this disease. Similar results were obtained with serum copper.

In a series of 150 patients with kwashiorkor, 30 were examined for serum copper, 35 for serum iron and 31 for iron binding capacity. The normal controls were respectively 25, 37 and 37. The serum copper in the patients amounted to 47·9% of the normal value, the serum iron to 64·7% and the iron binding capacity to 43·7%.

H. Lehmann

CLEGG, K. Mary. **The Availability of Lysine in Groundnut Biscuits used in the Treatment of Kwashiorkor.** *Brit. J. Nutrition.* 1960, v. 14, No. 3, 325–9.

"1. The method of Bruno & Carpenter (1957), which measures 'available lysine' by estimating free ε-amino groups, was applied to biscuit mixtures that have been used in the treatment of children with kwashiorkor in Uganda.

"2. It was found that the cooking of skim-milk powder with the other ingredients of the mixtures reduced the 'available lysine' by about one-third. The damage was probably caused chiefly by the lactose of the powder.

"3. It is suggested that the results could be correlated with clinical and biochemical findings in children treated with the biscuit mixtures."

VOLK, B. W. & LAZARUS, S. S. **Rabbit Pancreas in Protein Malnutrition (Experimental Kwashiorkor) and after Cortisone Administration.** *Amer. J. Path.* 1960, Aug., v. 37, No. 2, 121–35, 10 figs. on 3 pls. [35 refs.]

A group of 38 rabbits was fed on a diet high in carbohydrate and low in fat and protein, which resembled the diet of poor Jamaicans. After 15 weeks the animals had lost 20–50% of their weight. In the pancreas there was severe atrophy of the acinar cells and zymogen granules were markedly diminished. In the liver there was severe fatty degeneration, usually with fibrosis.

A group of 18 rabbits was fed a good diet, but given large doses of cortisone daily. In the pancreas of these animals there was extensive hyperplasia and

hypertrophy of the intralobular ducts. It is concluded that this proliferation is not due to the protein catabolic effect of the steroid, but is related to some other function of the hormone. *R. Passmore*

SCHREIER, K. & KAZASSIS, Corinna. **Influence of Different Types of Malnutrition on the 14C-Lysine Metabolism in Young Rats.** [Correspondence.] *Nature.* 1960, Sept. 24, v. 187, 1117–18. [11 refs.]

HAEMATOLOGY

LE VIGUELLOUX, J. & SANKALE, M. Protidogrammes et lipidogrammes chez le Soudanais. Définition des taux normaux et valeur dans le diagnostic d'orientation de quelques affections. [**Protein Distribution and Lipid Distribution in Sudanese. Definition of Normal Levels and Value in Diagnostic Outlook in Certain Diseases**] *Bull. Soc. Path. Exot.* 1960, Mar.–Apr., v. 53, No. 2, 366–84, 12 figs. (9 on 2 pls.) [13 refs.]

400 samples of serum from Africans in Bamako were examined, and it was confirmed that the albumin level was lower and the gamma globulin level higher in normal Africans than in normal Europeans. This, the authors consider, is a physiological rather than a pathological finding. In addition, children with kwashiorkor, patients with chronic nephritis, with cardiac oedema, lipoid nephrosis, ascites, leprosy, cirrhosis, cancer of the liver, and chronic fibrous splenomegaly, were examined. The great majority of the patients showed abnormal protein distribution on electrophoresis, after staining the paper strips both for protein and for lipids. The abnormalities followed the now well-established pattern but the authors emphasize the use of serum electrophoresis in following the course of chronic diseases. *H. Lehmann*

LANZKOWSKY, P. **Mean Haematological Values in Healthy Infants and Pre-School Children in Cape Town.** *South African Med. J.* 1960, June 4, v. 34, No. 23, 469–71.

Haemoglobin levels, measured by the oxyhaemoglobin method with a Klett-Summerson colorimeter, were determined on 610 white, 1,018 Cape coloured, and 737 African neonates, infants and pre-school children, all apparently healthy, who were living in Cape Town and its environs. The results are tabulated according to age and racial group, and show in all groups a high haemoglobin level at birth which falls to reach the lowest levels between the first and second years of age, and then gradually rises again in the years up to

age 7. A second table shows the percentage incidence of anaemia for each racial group at various ages when differing haemoglobin levels are taken as the criteria of anaemia. The incidence of anaemia is high at all ages beyond the first few hours of life, and is higher in non-whites. In general the Cape coloureds show a higher incidence of anaemia than the Africans. A small group of 35 apparently healthy Cape coloured infants and children were investigated in more detail and the anaemia was found to be a manifestation of iron deficiency. *S. Bell*

De Gruchy, G. C. **Red-Cell Metabolism: Fundamental and Clinical Aspects.** *Australasian Ann. of Med.* 1960, Aug., v. 9, No. 3, 237–46, 3 figs. [Numerous refs.]

A review.

Thapar, R. K. **Anaemia in Industrial Workers of Kanpur.** *J. Indian Med. Ass.* 1960, Aug. 1, v. 35, No. 3, 97–110, 5 figs. [15 refs.]

The author examined 310 villagers coming to seek work, and 801 industrial workers—males, females, and pregnant females. The basic examination was for Hb% and red cell count, and the results are tabulated for age, nature of employment, years in employment, hours of work per day, urine and stool examination, and state of nutrition; there are 31 tables in all. In many cases it appears that the analysis is more minute than the data warrant. However, it can be fairly safely concluded that anaemia was more common in those employed in industry than in their rural counterparts, that the textile and metal industries contained more anaemic workers than did other jobs, and that those who worked longer hours, and had been longer in industrial work, were generally the more anaemic. *Alan B. Raper*

Money, G. L. **Addisonian Megaloblastic Anaemia with Funicular Myelopathy in a Uganda African.** *East African Med. J.* 1960, Aug., v. 37, No. 8, 535–9, 1 fig. [11 refs.]

Chastel, C. Deux cas d'elliptocytose constitutionnelle observés chez des Africains en Haute Volta. [**Two Cases of Hereditary Elliptocytosis seen in Africans in the Upper Volta Region**] *Bull. Soc. Path. Exot.* 1960, Mar.–Apr., v. 53, No. 2, 357–65, 5 figs. on 2 pls. [21 refs.]

Cohen, A. L. & Wasserman, C. Anemia de Cooley. Talasemia. [**Thalassaemia**] *Semana Méd.* 1960, Aug. 1, v. 117, No. 10, 365–8, 4 figs. [22 refs.]

An account of 5 cases.

BANKS, L. O. & SCOTT, R. B. **Thalassemia in Negroes. Report of a Case of Cooley's Anemia in a Negro Child.** *Pediatrics.* Springfield, Ill. 1953, June, v. 11, No. 6, 622–7, 2 figs. & 1 chart. [18 refs.]

BOWLER, D. P. & VELLA, F. **Haemoglobin H—Thalassaemia and Obstructive Jaundice in an Indian Infant.** *Med. J. Malaya.* 1960, Mar., v. 14, No. 3, 181–3. [10 refs.]

SWARUP, S., GHOSH, S. K. & CHATTERJEA, J. B. **Glutathione Stability Test in Haemoglobin E—Thalassaemia Disease.** [Correspondence.] *Nature.* 1960, Oct. 8, v. 188, 153.

This report concerns young Bengalis, aged 1 to 28 years, with the moderately severe anaemia of Hb-E/thalassaemia. The test for stability of reduced glutathione (GSH) in erythrocytes was performed on 20 such subjects, and found to indicate instability of GSH in 8. In 20 normal subjects, GSH instability was found in 2, thus adding Bengalis to the races in which primaquine sensitivity may be expected.

In all the patients, sensitive and non-sensitive, the glucose-6-phosphate dehydrogenase activity of the red cells was high, though figures are not quoted. [This may be a reflection of the constant reticulocytosis—2 to 17%—but the complete dissociation between the level of this enzyme and GSH instability is surprising, even though it is known that it may not be the only enzyme involved.] *Alan B. Raper*

SCANDURA, S., LUCCI, R. & SOFFRITTI, E. La profilassi del morbo di Cooley in provincia di Ferrara. [**Prophylaxis of Cooley's Disease in the Province of Ferrara**] *Ann. d. San. Pubblica.* Rome. 1960, May–June, v. 21, No. 3, 803–10. English summary.

The authors point out that microcytaemia is very prevalent in the Po delta, even about 7% of the people in the city of Ferrara itself being affected, while in certain places round about, as many as 20% are affected. With this high incidence it is not to be wondered at that the homozygous form—Cooley's disease— is so common as to constitute a serious medico-social problem. As an example of this, in the only medical department for children in the province in the last 10 years, 10 times as many children have been found suffering from this disease as from leukaemia, and except for the perinatal period no other disease causes such a high mortality. Hence, since its genesis is hereditary, the aim should be to discourage the marriage of microcytaemics. Last year (1959) the authors decided to try to undertake this considerable essay in eugenics, first of all by trying to ascertain the numbers of affected children in the primary schools, starting with those in 2 communes. A rapid test for detecting reduced red-cell fragility was used. (A drop of blood from the finger was taken up in a red-cell counting pipette and diluted appropriately with Tyrode's solution. Normal RBC haemolyse very quickly, microcytaemic cells only slightly or not at all.) The results were: commune (a) 984 examined, 124 positive; commune

(b) 697 examined, 120 positive. Having detected the children who were affected, the authors then examined their families, blood films being also used where necessary. In (a) 97, and in (b) 93 families were tested. A card was then given to the parents pointing out that while they should not be alarmed, their children were found to be carrying a hereditary blood condition, warning them against marriage with any person with the same condition, and advising that the proposed fiancé(e) should also be tested lest any children of that marriage be affected with the actual disease and die in infancy or early childhood. The advice was surprisingly well received and the results have been sufficiently encouraging to lead to an investigation in 2 more communes this year, later to be extended to the whole province.

[This is obviously an investigation and a eugenic measure of great importance which without doubt will be followed with interest by many outside Italy.]

W. K. Dunscombe

MEHTA, S. R. & JENSEN, W. N. **Haptoglobins in Haemoglobinopathy: a Genetic and Clinical Study.** *Brit. J. Haematol.* Oxford. 1960, July, v. 6, No. 3, 250–58, 5 figs. (3 on 2 pls.) [23 refs.]

MCCORMICK, W. F., with the technical assistance of Barbara J. THOMPSON. **Abnormal Hemoglobins. I. Incidence in Memphis and Western Tennessee, with special reference to Autopsy Material.** *Amer. J. Clin. Path.* 1960, Sept., v. 34, No. 3, 220–24. [20 refs.]

A survey for abnormal haemoglobins (by electrophoresis) was made in Tennessee. None was found in 1,250 whites. Among 2,800 Negroes over 1 month of age, the following combinations were found: AS 9·1%, SS 0·7%, SC 0·14%, AC 2·1%, AG, AL and AD, 1 case each, Hb-C/thalassaemia 1 case. The author comments on the higher ratio of SS to AS subjects in their series (1 : 13) as compared with the usual ratio (1 : 30 or 40) in the United States, and ascribes this result to their inclusion of young children, and remarks, "We . . . have observed that more than three fourths of patients with sicklecell anemia die before the age of 1 year".

Autopsies were performed on 1,200 of the 2,800 Negro patients. Sickled cells were looked for in sections of organs fixed in formalin, and found in all cases where some combination of Hb-S had been detected in the blood. But in 4 out of 1,069 AA subjects the sections contained apparent sickles. [The abstracter can confirm that these false positives detract from the value of histological diagnoses of sickling.]

Alan B. Raper

DE TORREGROSA, M. V., DAPENA, R. B., HERNANDEZ, H. & ORTIZ, A. **Association of *Salmonella*-caused Osteomyelitis and Sickle-Cell Disease. Report of Three Cases.** *J. Amer. Med. Ass.* 1960, Sept. 24, v. 174, No. 4, 354–6, 2 figs. [12 refs.]

The cases occurred in Puerto Rico.

SALISBURY, P. F. **Recovery from Acute Renal Failure and Acidosis in Sickle-Cell Disease.** *J. Amer. Med. Ass.* 1960, Sept. 24, v. 174, No. 4, 356–8. [10 refs.]

Report of a case in California.

SCOTT, R. B. & FERGUSON, Angella D. **Studies in Sickle-Cell Anemia. XIV. Management of the Child with Sickle-Cell Anemia.** *Amer. J. Dis. Children.* 1960, July, v. 100, No. 1, 85–93, 4 figs. [16 refs.]

Intravascular sickling of the erythrocytes most commonly leads to significant pathological changes in children in the following types of haemoglobinopathy: (i) homozygous S or sickle-cell anaemia, (ii) sickle-cell-haemoglobin-C disease, (iii) sickle-cell thalassaemia (microdepanocytic disease). Of these, sickle-cell-haemoglobin-C disease, in the absence of extensive bony involvement [which is very rare], is a relatively benign condition [this *Bulletin*, 1955, v. 52, 1136] manifested as a chronic haemolytic anaemia, which rarely undergoes exacerbations or crises. However, crises of varying severity and frequency characterize the other 2 types of haemoglobinopathy.

Since crises are commonly precipitated by infections, especially of the upper respiratory tract, the authors, as a routine, administer a long-acting sulphonamide together with injection of gamma globulin to their patients during the winter and spring. The agents which they recommend are acetyl sulphisoxazole (Lipo-Gantrisin), sulphamethoxypyridazine (Kynex), sulphaethidole (Sul-Spansion), while gamma globulin is given as a monthly intramuscular injection in a dosage of 0·3 ml. per kgm. body weight. They have noted no benefit from the prolonged administration of acetazolamide (Diamox) [*ibid.*, 1957, v. 54, 1350], 7–15 mgm. per kgm. body weight, and this experience is shared by other American workers [*ibid.*, 1958, v. 55, 686].

The types of crisis which are encountered in these 3 types of haemoglobinopathy are:—

(i) "thrombotic", characterized by fever and local pain, but no significant change in the Hb concentration, haematocrit or serum bilirubin level;

(ii) "haemolytic", with fever, generalized pain, evidence of an accelerated rate of haemolysis and a fall in the concentration of erythrocytes and haemoglobin;

(iii) "aplastic", associated with pain, a rapid fall in the erythrocyte and Hb concentrations, in which the bone marrow shows marked depression of erythropoiesis [due to intercurrent infections in most instances].

The control of "crises" constitutes the very limited scope of therapy of this disease up to the present time. Sedatives and agents likely to expand the blood volume, such as plasma, dextrose solution and polyvidone, are recommended by the authors for the treatment of thrombotic attacks: steroids may alleviate acute synovial effusions. Transfusion of packed red cells is indicated in profound anaemia or before operations, or when shock occurs as a result of massive infarction; Diamox, a carbonic anhydrase inhibitor, has given disappointing results in the experience of the authors. Splenectomy is of no benefit and may be disadvantageous in the young child; in later childhood the spleen is often gradually destroyed by repeated infarction. In the supervision of the

child suffering from sickle-cell anaemia the prevention or prompt control of infections is the general measure of greatest importance.

Four case histories are given. *J. H. Walters*

HUNT, J. A. & INGRAM, V. M. **Abnormal Human Haemoglobins. IV. The Chemical Difference between Normal Human Haemoglobin and Haemoglobin C.** *Biochim. et Biophys. Acta.* 1960, Aug. 26, v. 42, No. 3, 409–21, 5 figs. [35 refs.]

BARROW, Dorothy H. E. & KOHLER, H. G. **Haemoglobin 'Barts'—a Rare Abnormality in the Newborn.** *Arch. Dis. in Childhood.* 1960, Aug., v. 35, No. 182, 360–63, 3 figs.

"Haemoglobin 'Barts' was found in the blood of an anaemic West Indian newborn girl. No evidence of this abnormal haemoglobin variant was found in either parent, but the father was heterozygous for Hb-S. By the age of 15 weeks 'Barts' could no longer be demonstrated in the infant's electrophoretogram. This is the second case found in this country."

[See this *Bulletin*, 1958, v. 55, 936.]

VENOMS AND ANTIVENENES

MORTON, T. C. **Adder-Bites in Cornwall.** *Brit. Med. J.* 1960, July 30, 373–6. [13 refs.]

The author, writing from Cornwall, has seen 12 cases of adder bite during the last 8 years, and has been consulted about a further 6. Most of these accidents arose from foolhardy attempts to capture the snakes, or from teasing them. He states that there are 7 reported fatalities from adder bite in England and Wales, but that since 1945 the only death after adder bite was due to anaphylaxis which occurred in a boy of 14 within a few minutes of the injection of antivenene serum.

The venom of *Vipera berus* is not very toxic, the MLD for a 600 gm. guineapig being 40 mgm., as compared with 1 mgm. for Russell viper venom. The venom contains a small but variable amount of neurotoxin, a haemorrhagin which damages capillary endothelium, and a weak cytotoxin. The manifestations of envenomation depend upon the age and state of health of the victim, and whether the snake has already bitten an earlier victim within a few hours. The venom is injected through two hollow fangs which are projected forward at the time of attack.

Though most examples of adder bite give rise to no concern, the author has treated 3 severely affected patients, in whom vomiting and circulatory collapse were prominent. Local reactions comprise swelling, haemorrhagic bullae, petechiae and proximally spreading oedema. Since the venom is absorbed via the lymphatics, regional lymphadenopathy often follows. General symptoms

will develop within 2 hours of envenomation; if none have appeared within this period, antiserum administration will not be required.

Treatment depends upon the period which has elapsed since the bite, also on the age and state of health of the victim. The heroic local treatment of former days is to be condemned, and incision, rubbing in of permanganate crystals and the injection locally of soap solutions should be abandoned. Immobilization of the bitten limb will delay absorption *via* the lymphatics. [The author makes no mention of cryotherapy, which is an effective measure in bites by the more venomous viperine species.] When the subject is seen within 2 hours of the bite, antivenene (Pasteur Institute ER serum in 10 ml. ampules) should be infiltrated locally in 1–3 ml. amounts, preferably into the puncture marks themselves, and the residue of a 10 ml. ampule in the case of a child, or of 2 such ampules in an adult, should then be injected intramuscularly into the buttock. Should at least 2 hours have elapsed since the attack, antivenene is only indicated when marked general symptoms are present. In their absence, rest and the administration of antihistamine drugs, such as promethazine or Piriton, are all that is required.

[See also this *Bulletin*, 1957, v. 54, 1460; 1958, v. 55, 89.] *J. H. Walters*

RAVISSE, P. Notes sur les serpents de Brazzaville. **[Notes on the Snakes of Brazzaville]** *Bull. Inst. Études Centrafricaines.* (n.s.) 1960, Nos. 19/20, 45–53.

BETTINI, S. & FINIZIO, E. Indagine sui casi di latrodectismo verificatisi negli anni dal 1938 al 1958 in alcune province d'Italia. Nota II—Provincia di Grosseto. **[Survey on the Cases of Latrodectismus occurring during the Years from 1938 to 1958 in some Provinces of Italy. Note II—the Province of Grosseto]** *Riv. di Parassit.* Rome. 1960, June, v. 21, No. 2, 131–41, 5 figs. English summary.

Bettini has already reported [this *Bulletin*, 1960, v. 57, 1107] on his findings from a similar investigation in the Province of Viterbo. The authors of the present report have followed similar methods for interpreting the records of 5 local hospitals, serving an aggregate population of 100,256, in the Province of Grosseto. They found that 303 persons had been admitted during 1938–58 because they had been bitten by what was "highly probably" or "probably" the spider *Latrodectus tredecimguttatus*; the corresponding incidence of snake bites, mostly viperine, had been 67. Men had been bitten by spiders more often than women and the age-groups of 15–30 and 37–60 years were mostly involved. June to August seemed to be the season of highest prevalence and there was a considerable increase of these spider bites during 1947–52.

The province consists of hills surrounding a coastal plain and the biting by spiders seemed to be limited to the plain.

One fatal case is reported. *J. Cauchi*

KEEGAN, H. L., HEDEEN, R. A. & WHITTEMORE, F. W., Jr. **Seasonal Variation in Venom of Black Widow Spiders.** *Amer. J. Trop. Med. & Hyg.* 1960, Sept., v. 9, No. 5, 477–9. [11 refs.]

J. Trop. Med. & Hyg. 1960, Sept., v. 63, No. 9, 222–3, 2 figs. **Stone-Fish Poisoning.**

See this *Bulletin* 1960, v. 57, 942.

TOXOPLASMOSIS

Seeman, J. Vysledky sérologického vyšetřování u různých skupin obyvatelstva ČSR na toxoplazmózu. [**The Results of an Immunological Survey among the Czechoslovak Population for Toxoplasmosis**] *Československ. Epidemiol., Mikrobiol., Imunol.* Prague. 1960, v. 9, Nos. 5/6, 398–401. [10 refs.]

In a survey of the incidence of human toxoplasmosis in Czechoslovakia complement-fixation tests were carried out on the sera of 768 persons living in urban, rural and mixed localities in the neighbourhood of Prague and Olomouc. A positive result in a titre of 16 or higher was obtained in 169 (22·0%) sera, with a higher proportion in the rural (26·9%) than in the urban (14·2%) dwellers. The higher incidence in the former group was ascribed to the increased frequency of contact with animals. *D. J. Bauer*

Havlík, O. & Hübner, J. Výsledky sérologického vyšetřování na toxoplazmózu domácích i volně žijících zvířat v ČSR. [**The Results of a Serological Investigation for Toxoplasmosis of Domestic and Wild Animals in Czechoslovakia**] *Československ. Epidemiol., Mikrobiol., Imunol.* Prague. 1960, v. 9, Nos. 5/6, 391–7, 1 graph. [36 refs.]

In a study of the distribution of *Toxoplasma* infection the dye test was carried out on the sera of 581 wild and 1,306 domestic animals and 325 birds in 6 administrative areas of Bohemia. Positive results in titres of 4 or higher were obtained in 682 (52·2%) domestic animals, mainly in rabbits (198 of 223, 88·7%), goats (70 of 83, 84·3%), cats (164 of 215, 76·2%) and dogs (83 of 161, 51·5%). Similar titres were also observed in 63 (10·9%) wild animals (mainly hedgehogs, hares and deer) and 17 (5·2%) birds. From the results obtained, cats and dogs are considered to be the most important sources of human infection. *D. J. Bauer*

Muñoz-Rivas, G. Toxoplasmosis en Colombia. [**Toxoplasmosis in Colombia**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, Dec., v. 19, No. 4, 351–5. English summary (3 lines).

Among 354 Sabin-Feldman reactions in Bogotá, 85 (24%) gave positive results.

[See also this *Bulletin*, 1957, v. 54, 216.]

VASINA, S. G. & DUNAEVA, Z. V. **[On the Survival Rate of *Toxoplasma* outside the Organism]** *Med. Parasit. & Parasitic Dis.* Moscow. 1960, v. 29, No. 4, 451–4. [13 refs.] [In Russian.]

The English summary appended to the paper is as follows:—

"When stored in a refrigerator at 4–5° the toxoplasms contained in the preserved donor's blood and in the defibrinated blood of a normal rabbit maintained their pathogenicity to mice for a period of 45 days—in one instance—and for 30 days—in the second.

"The mice infected with these toxoplasms developed an acute lethal infection which lasted for 8–12 days, instead of 3–5 observed in the infection with toxoplasms, freshly isolated from mice."

VAN DER WAAIJ, D. **Formation, Growth and Multiplication of *Toxoplasma gondii* Cysts in Mouse Brains.** *Trop. & Geograph. Med.* Amsterdam. 1959, Dec., v. 11, No. 4, 345–60, 5 figs. & 4 graphs. [12 refs.]

The author discusses the nature of the agglomerates formed by *Toxoplasma* in chronic infections, variously described as "cysts" or "pseudocysts". Since the interpretation of their nature depends on the mode of formation of the membrane enclosing the parasites, this is the main problem dealt with in this paper. A study was carried out of sections of brain from mice infected with an avirulent strain (Burk) which encysts without producing clinical manifestations.

The rapid development and growth of an enclosing membrane, without any trace of host-cell nucleus, as well as failure to obtain specific staining of histological elements, indicated that this membrane is not formed by the host's tissues. It has also been shown that it is not the result of a reactive precipitate. Hence it is concluded that the wall is produced by the parasite itself, and the structure in question is a true cyst [see also this *Bulletin*, 1959, v. 56, 766]. Apparently cyst-formation is associated with the development of specific resistance to the infection: probably a protective membrane is formed around a single parasite, which then multiplies rapidly within the cyst wall. From time to time single toxoplasms emerge from the cyst by boring a hole in its wall, and proceed to form new cysts, usually in the brain. In mouse brain cysts originally measuring 7–8 μ in diameter increase to 42–43 μ in 4 months. There appears to be a correlation between the number of cysts inoculated and those developing in the brain, moreover the latter increase in numbers in the course of the infection. *C. A. Hoare*

JACOBS, L., REMINGTON, J. S. & MELTON, Marjorie L. **The Resistance of the Encysted Form of *Toxoplasma gondii*.** *J. Parasitology.* 1960, Feb., v. 46, No. 1, 11–21, 2 figs. [32 refs.]

There is increasing evidence to suggest that toxoplasmosis may be acquired by ingestion of cysts of *Toxoplasma* contained in meat of infected food hosts [this *Bulletin*, 1957, v. 54, 215]. In order to throw further light on this mode of transmission, the authors have carried out experiments on the viability of cysts after exposure to various conditions. For this purpose toxoplasmic cysts were removed from the brain of chronically infected rats with the help of a

micromanipulator and suspended in saline. The results of the experiments were assessed by intraperitoneal inoculation of suspensions of treated cysts into mice, their survival time or serological tests being used to determine infectivity. For comparison, similar tests were made with the proliferative forms of the parasite.

It was found that the cysts survived for up to 68 days when stored at 4°C. When subjected to the action of peptic juice, they remained infective up to 3 hours, whereas proliferative forms were destroyed in a few minutes. However, parasites liberated from cysts by peptic juice survived for 2 hours. Exposure to 1% trypsin destroyed the cyst wall immediately, while the liberated parasites remained viable for 6 hours, but proliferative forms survived for only 3 hours. In distilled water cysts lost their infectivity within 30 minutes, but in saline they survived up to 12 but not up to 24 hours. At a temperature of 50°C. cysts lost viability after 30 minutes, at 56°C. after 10–15 minutes, but some were not viable after exposure to 45° for 1 hour. Both freezing and drying caused loss of infectivity of the cysts. *C. A. Hoare*

JACOBS, L., REMINGTON, J. S. & MELTON, Marjorie L. **A Survey of Meat Samples from Swine, Cattle, and Sheep for the Presence of Encysted *Toxoplasma*.** *J. Parasitology*. 1960, Feb., v. 46, No. 1, 23–8. [26 refs.]

It is generally thought that human toxoplasmosis may be acquired by ingestion of infected meat but there is insufficient information regarding the presence of cysts of *Toxoplasma* in the flesh of food animals [this *Bulletin*, 1958, v. 55, 572]. In order to fill this gap in knowledge, the authors made a survey based on the examination of samples from the diaphragm of 60 cattle, 50 pigs and 86 sheep, obtained from Baltimore. For this purpose specimens of meat were digested in peptic solution for 2 hours; the resulting suspension was filtered and centrifuged, and—after removal of supernatant fluid—the sediment was resuspended in saline and recentrifuged; the final sediment was then suspended in saline and inoculated intraperitoneally into mice. These were examined for the presence of toxoplasmic infection microscopically and by the dye test.

The results of this survey were as follows. Parasites were isolated from 8 pigs and 4 sheep, while positive dye tests were obtained in mice inoculated from 4 pigs, 1 bovine and 4 sheep. Toxoplasmosis was thus demonstrated in 24% of the pigs examined, in 1·7% of cattle and 9·3% of sheep.

In discussing these results, the authors point out that, while they provide definite evidence of the presence of *Toxoplasma* cysts in the flesh of food animals, thus supporting the hypothesis that human toxoplasmosis may be acquired by ingestion of underdone meat, there must also be other methods of transmission, since the incidence of this disease among vegetarians (including Hindus) is as high as among meat-eaters [*ibid.*, 1959, v. 56, 766]. *C. A. Hoare*

BAKAL, P. M. Het probleem van de specificiteit van de reactie van Sabin en Feldman bij de diagnostiek van toxoplasmosis. **[The Problem of the Specificity of Sabin and Feldman's Reaction in the Diagnosis of Toxoplasmosis]** [Thesis.] 71 pp., 2 figs. [Numerous refs.] 1959. Leiden: Laboratorium voor Parasitologie, Rijksuniversiteit, Holland.

In this thesis the author considers in great detail the question of the specificity of the Sabin-Feldman dye test for toxoplasmosis. One of the factors

responsible for non-specific reactions was found to be the time required for inactivation of the serum of 56°C. Thus, bovine serum should be treated for 1½ hours, while rabbit serum is inactivated in 30 minutes. In view of previous reports indicating that animals infected with *Trichomonas vaginalis*, trypanosomes and sarcosporidia reacted positively to the dye test, the author repeated these experiments with infected rodents, but obtained negative results. Similarly the dye test was negative in rabbits infected with various bacteria and viruses. However, the reaction was positive in 132 out of 200 sera from healthy human blood donors, with titres from 1 in 8 to 1 in 512. After a statistical analysis of these results, the author concluded that the antibody in these cases was antitoxoplasmic. Among the 200 persons examined serologically, the percentage of negative results in the dye test decreased with the age of the donors, the average titre per age-group decreasing with the increase in years. On the basis of these results the author regards the dye test as specific for *Toxoplasma*.

C. A. Hoare

KNIERIM, Feliza, NIEDMANN, G. & THIERMANN, Erica. La reacción de hemaglutinación aplicada al diagnóstico serológico de la toxoplasmosis. [**The Haemagglutination Test in the Serological Diagnosis of Toxoplasmosis**] *Bol. Chileno de Parasit.* 1960, July–Sept., v. 15, No. 3, 48–50.

The English summary appended to the paper is a follows:—

"The Sabin-Feldman test for the diagnosis of toxoplasmosis is useful, but it has several practical drawbacks: it is time-consuming and involves the danger of laboratory infections. Attempts have been made to replace it by the simpler and safer hemagglutination technic. In this paper the authors report a comparative study in which both technics were used.

"On a total of 432 serums 88% of coincident results were obtained. Therefore it is concluded that both tests have a similar degree of sensitivity and specificity. Since the hemagglutination test is simpler, the authors contend that it could be used as a substitute for the Sabin-Feldman test in the routine serologic diagnosis of Toxoplasmosis."

NEUMANN, Charlotte G., HILTON, C. & BARREDA, A. **Acquired Toxoplasmosis in a Child.** *Amer. J. Dis. Children.* 1960, July, v. 100, No. 1, 117–20, 1 chart.

Acquired toxoplasmosis may give rise to no symptoms, or may be manifested by ocular changes, febrile lymphadenopathy, a typhus-like fever or as an encephalitis.

A 2½-year-old Puerto Rican boy, who had been living in New York for 9 months, was admitted to the Bellevue Hospital with fever, vomiting and rash of 1 week's duration. His parents and 2 siblings were healthy. The rash, which had developed on the third day of the fever, was maculo-papular with vesiculation, and covered the entire body. After 1 week enlarged posterior cervical lymph glands were noted and the eyelids became puffy. Moist rales were heard in the lungs and the X-ray picture showed reticulation throughout both lung fields. There was no response however to penicillin, chloramphenicol or later to antituberculous drugs. At about the end of the first week enlargement

of both liver and spleen was discovered, and a leucocytosis of 20,000 per cu.mm. with 40% adult and 46% immature polymorphs was noted.

At the end of the second week of his illness he became irritable and lethargic and showed slight neck rigidity; lumbar puncture however showed a normal cerebrospinal fluid. At the same time extreme anorexia necessitated tube feeding. A further curious phenomenon now developed, for his leg muscles became acutely tender on palpation or movement, with marked hyperaesthesia of the overlying skin. A diagnosis of trichinosis was suggested but was disproved.

Abnormal liver function was demonstrated during the second and third weeks, the serum albumin level falling while that of the globulin rose, transaminase values were elevated and flocculation tests became positive. By this time investigation for all possible bacterial aetiological agents had proved negative, latex tests for rheumatoid disease were likewise negative, as were the Wassermann and LE cell tests. A 10 days course of antituberculous treatment had proved ineffective. During the sixth week however the possibility of toxoplasmosis was considered and received support when the result of the toxoplasmosis dye test on the serum showed a titre of 1 in 4,096; this rose to 1 in 16,384 by the tenth week. Absolute confirmation of the diagnosis was obtained by the isolation of toxoplasma in mice from an excised posterior cervical lymph node which had been removed during the ninth week.

Spontaneous recovery began to take place during the eleventh and twelfth weeks, the periorbital and ankle oedema disappeared, the leg tenderness grew less and the hepatosplenomegaly declined. Occasional spikes of fever continued to occur for several more weeks, however, Signs of healed choroidoretinitis were observed in each eye during the twenty-first week, and were attributed to the disease. Recovery was complete some 5 months after the onset of the disease, though the dye test was still positive at a titre of 1 in 16,384.

[This is an excellent account of an uncommon disease of ubiquitous distribution, which illustrates the diagnostic difficulties to which it often gives rise.]

J. H. Walters

Dachy, A. Maladie des inclusions cytomégaliques et toxoplasmose. Eléments de diagnostic différentiel. [**Cytomegalic Inclusion Disease and Toxoplasmosis. Points in Differential Diagnosis**] *Bruxelles-Méd.* 1960, Sept. 11, v. 40, No. 36, 1228–37. [Numerous refs.]

The English summary appended to the paper is as follows:—

"A case is described where an association was found of congenital toxoplasmosis and of cytomegalic inclusion disease demonstrable in the parotid glands and in the kidneys.

"Some epidemiologic, pathogenic, clinical and pathological characters of both diseases are very similar.

"Elements of differential diagnosis are set forth."

Fulton, J. D. & Spooner, D. F. **Metabolic Studies on** *Toxoplasma gondii*. *Exper. Parasit.* New York. 1960, June, v. 9, No. 3, 293–301, 4 figs. [25 refs.]

A suspension of toxoplasmas, free from cells and other contaminants was prepared from the peritoneal fluid of infected cotton-rats [for technical details,

see original]. This suspension had no endogenous respiration; but when glucose was added it oxidized the glucose and produced carbon dioxide. Apparently glucose is the main source of energy, and the process of oxidation follows a pathway similar to the Embden-Meyrhof-Parnas scheme of phosphorylating glycolysis. The presence of hexokinase in the homogenate could be demonstrated. The glucose was broken down to lactic, acetic and another unidentified acid; traces of propionic, butyric and valeric acid were demonstrated among the end products by gas-phase chromatography. Pyruvic acid was present only in traces. It was further found that *Toxoplasma* can oxidize reduced diphosphopyridine nucleotide and it contains a cytochrome system. There is also an active catalase, so that the parasite can withstand hydrogen peroxide. The respiration of *Toxoplasma* was reduced by adding sera of animals or patients which contained antibodies.

[This valuable paper contains much important information and it should be consulted in the original by those interested.] *F. Hawking*

DERMATOLOGY AND FUNGUS DISEASES

JOPLING, W. H. **Tropical Skin Disorders which may be encountered in Britain.** Extract from *Trans. St. John's Hosp. Dermat. Soc.* 1959, No. 42, 8 mimeographed pp. [23 refs.]

This paper contains a great deal of condensed information on tropical affections of the skin which may come to the notice of practitioners outside the tropics, for whom the paper is intended.

The author gives a number of differential diagnoses under 5 headings, according to whether the patient complains of (1) an irritating rash, (2) a boil, (3) a swollen limb, (4) depigmentation or (5) an ulcer. The many conditions described and their differentiation will be familiar to readers of this *Bulletin*: but this summarized presentation in one paper makes a valuable contribution for the use of doctors in temperate climates who may not be familiar with them but who, because of increasingly close international communications, are liable to met them in their practice and should keep their possible presence constantly in mind. *H. J. O'D. Burke-Gaffney*

EALES, L. **Cutaneous Porphyria. Observations on 111 Cases in Three Racial Groups.** *South African J. Lab. & Clin. Med.* 1960, June, v. 6, No. 2, 63–94, 16 figs. [28 refs.]

Between 1939 and 1959, 143 cases of porphyria were seen in Cape Town. 4 cases were excluded from this presentation: of the remaining 139, no less than 111 had cutaneous manifestations, alone or in association with acute abdominal attacks. These comprised 56 white, 17 Bantu and 38 Cape Coloured patients.

White males and females were equally affected; but purely cutaneous involvement was commoner among males. The sexes were equally affected in the

Bantu but the involvement was purely cutaneous. In Coloureds, males preponderated and purely cutaneous involvement was pronounced; in Coloured females mixed manifestations were commoner. The onset of cutaneous symptoms was commonly in the third decade in white and Coloured patients, while in the Bantu, the fourth decade provided the peak incidence. A positive family history of the disease was obtained in 36 of 56 white patients, 9 of 38 Coloured and in none of the Bantu, but the disease might be latent in other members of a family and only be detectable biochemically.

The cutaneous manifestations consisted of abnormal fragility of the skin, giving rise to blisters or erosions on skin exposed to light after trivial trauma; scarring which was sometimes minimal and at others mutilating, and which could be pigmented or vitiliginous; milia; hyperpigmentation of exposed areas and hirsutes of the face. Only 24 patients, 15 of them white, complained of light sensitivity. Dark urine had been noticed by 36 white, 22 Coloured and 11 Bantu. 50% of the Coloured patients were alcoholics. Diffuse hepatomegaly was found in one-third of the Bantu and Coloured and was commoner in the purely cutaneous cases. " Liver function tests " were abnormal most often in the Bantu, rarely in the white and only a little more often in the Coloured. Hypoalbuminaemia was infrequent. Serum globulin levels exceeding 3 gm.% were found in 75% of Bantu, 66% of Coloured and less than 15% of white patients. Serum bilirubin levels more than 1·0 mgm.% were rare. Liver biopsy was performed in 16 cases: in the 5 white patients, cirrhosis was definite in 2 and there was mild periportal fibrosis in 1. In the 10 Coloured, cirrhosis was present in 2, fatty change in 2 and slight parenchymal necrosis in 1. In the single Bantu, there was insufficient evidence for a diagnosis of cirrhosis. The liver was fluorescent in many of the cases.

In the white patients uroporphyrinuria was mild (less than 50 μgm./1.) in 6, within normal limits (up to 25 μgm./1.) in 2: the highest values were found in patients with mixed manifestations during acute attacks but values of more than 1,000 μgm./1. were recorded in 2 with purely cutaneous involvement. The Coloured porphyrics showed high values with purely cutaneous lesions. In the Bantu gross uroporphyrinuria was the rule. The author established normal values of faecal porphyrins in 100 healthy subjects of all three races, 90% showing values of 75 μgm./gm. for total porphyrins, dried weight, with a range of 2–132 μgm./gm. In the porphyrics, only 4 of 36 white cases showed stool porphyrins within normal limits and in another the level was slightly raised: all 5 had the purely cutaneous syndrome and a negative family history of the disease. 3 were alcoholics and in 2 of these cirrhosis was present. In 20 of the remaining 31 grossly increased stool porphyrins were detected (210–2,460 μgm./gm.) and there was a family history of the disease. In Coloured porphyrics 9 of 19 patients showed normal stool porphyrins. In 2 others they were " slightly raised " and in the remainder " raised ", but in only 4 of the 9 did the levels exceed 500 μgm./gm. Only 1 of the patients with cutaneous symptoms but all 4 with the mixed syndrome had a positive family history: all had raised faecal porphyrins. Of 10 Bantu patients, 9 showed normal stool levels.

The author therefore distinguished two forms of the disorder. In one the family history was usually positive. Cutaneous features might or might not be associated with acute porphyria. The degree of uroporphyrinuria was variable but faecal porphyrins were markedly raised. In the other form there was no evidence that it was inherited. The symptoms were purely cutaneous.

Uroporphyrinuria was gross and stool porphyrin levels were normal or only slightly raised. White patients constituted the majority of the first group. Bantus belonged to the second and Coloured patients showed both forms. The article contains tabulated clinical and biochemical data on all 111 cases and the skin changes are well presented in 10 black and white photographs.

P. J. Hare

KANTEMIR, I., GENER, S., KAYAALP, O. & TIMLIOGLU, Ö. **Experimental Studies on Hexachlorobenzene and Organic Mercurial Compounds which are used to protect Wheat Seed from Fungal Diseases.** *Türk Ijiyen ve Tecrübî Biyoloji Dergisi*. Ankara. 1960, v. 20, No. 1, 31–6. [Fuller version in Turkish 19–30, 2 figs.]

———— & TIMLIOGLU, Ö. **Experiments on Acute Toxicity of Hexachlorobenzene Preparations used to protect Wheat Seed from Fungal Disease.** *Ibid*., 45–9. [Fuller version in Turkish 37–44.]

————, CAM, C. & KAYAALP, O. **Investigations and Observations on Two Diseases: Kara Yara and Pembe Yara which are observed in the South-East Part of Turkey.** *Ibid*., 79–83. [Fuller version in Turkish 51–77, 22 figs. on 5 pls. (13 refs.)]

These papers from the Institute of Pharmacology of the Faculty of Medicine, University of Ankara, and from the Clinic of Dermatology of the Diyarbakir Nümune Hospital describe a nutritional intoxication that has appeared recently in Turkey, and toxicological studies of wheat fungicides that have been made to determine its cause.

Kara yara (blackwound) and pembe yara (rosewound) were first observed in 1955 as an epidemic outbreak widely distributed in villages and towns in south-east Turkey. Kara yara occurs in adults and children more than 3 years old; pembe yara occurs only in breast-fed children. The geographical distribution of both diseases is closely related to that of fungicides issued by the government to protect wheat from the fungus *Tilletia tritici*. The fungicides are mixed with the wheat grain, and therefore may contaminate bread; organic mercury fungicides have been in use since 1925, but hexachlorobenzene only since 1954. A survey of 3 villages showed that about 1 person in 15 of the population was suffering from one or other of the diseases.

Kara yara is said to be a "toxic skin porphyria" which the authors believe is different to skin porphyrias hitherto described. The age and sex incidence is mostly in males from 5–15 years, and more rarely in adults. The disease starts with vesiculation of the skin of face, hands, legs and feet, leading to ulceration, scarring, dark coloured pigmentation and hypertrichosis. The skin signs seem to be related to exposure to sunshine, and the condition is worse in the summer. The urine, in all cases, contains coproporphyrin, digestion is normal, there is no fever, the disease may last for several years, and is rarely fatal. All patients had eaten wheat mixed with fungicide.

Pembe yara is confined to breast-fed children. The characteristic lesions are papulo-erythematoid rose-coloured patches on the hands and legs. Porphyrinuria seldom occurs, and when it does there is less coproporphyrin than in kara yara. There is no porphyrin in the mothers' milk, but it was found that apparently normal parents had latent kara yara with coproporphyrinuria. There

is frequently diarrhoea and bronchitis, and the disease may last for several years. The fatality rate is about 10%. Mercury was absent from urine in all tests.

Rats and rabbits were fed on the two types of fungicide. Rabbits were found to be more suitable, as normal control rats showed varying amounts of porphyrinuria, normal rabbits none. Mercury compounds used in proprietary fungicides (Ceresan) contain ethylmercuric chloride, phenylmercuric acetate and methoxyethylmercuric chloride. These preparations given alone or mixed with wheat caused no change in the degree of porphyrinuria of rats (LD50=15–20 mgm./kgm.) and no occurrence of porphyrinuria in rabbits after feeding for several months. Feeding hexachlorobenzene as Sürmesan (=10% hexachlorobenzene) alone, or mixed 2:1,000 with wheat to rats, was lethal (LD50=750 mgm./kgm.), the rats dying after being fed for 1 to 2 months with 20 gm. per day of the wheat mixture, all showing marked porphyrinuria. Rabbits fed with Sürmesan in doses of 75 mgm./kgm. hexachlorobenzene daily showed coproporphyrinuria after 6 days, which increased, leading in some cases to death with convulsions in about 2 weeks. All rabbits on wheat dosed with Sürmesan in ratios of 2:1,000 and 4:1,000, either exclusively or with mixed diets, developed coproporphyrinuria and died. At autopsy liver damage was observed. Experiments with pure hexachlorobenzene showed that the pure chemical was less toxic than the commercial preparation, and that its administration suspended in water was more lethal than suspended in oil.

Both on epidemiological and toxicological grounds it is concluded that the cause of the disease is intoxication with hexachlorobenzene.

Hexachlorobenzene or perchlorobenzene (C_6Cl_6) is not to be confused with the insecticide BHC (hexachlorocyclohexane $C_8H_6Cl_6$) which has a similar name.

[The clinical account of kara yara appears to be similar to that of adult chronic porphyria described by BRUNSTING *et al.* (*J. Amer. Med. Ass.*, 1951, v. 146, 1207), differing chiefly in age incidence and epidemiology. The American description attributes the disease to liver damage that may be caused by intoxication with a number of different poisons, particularly alcohol. There are no records of tests of liver function or observations of liver pathology in these papers, except the note that the rabbits poisoned with hexachlorobenzene showed liver damage.] *T. P. Eddy*

SCHMID, R. **Cutaneous Porphyria in Turkey.** *New England J. of Med.* 1960, Aug. 25, v. 263, No. 8, 397–8, 1 fig.

The author, who is Assistant Professor of Medicine in Harvard Medical School, notes that scattered reports have been received of an outbreak of cutaneous porphyria in Turkey. He made a short visit to that country in January 1960 and gives some information on the conditions. The clinical features and urinary findings are described and correspond with those noted above. The syndrome is more frequent in children and adults, usually affects several members of a family, is more frequent in farmers, has a seasonal incidence in summer with remission in winter and relapses in subsequent summers.

Evidence is produced to suggest its association with the use of the fungicide, hexachlorobenzene, so that the disease is evidently that described by KANTEMIR *et al.* [above] under the name of "kara yara". The syndrome has been

appearing since 1956. Since 1955 seed wheat mixed with fungicidal agents containing 10% hexachlorobenzene has been distributed annually to farmers in the districts of Urfa, Diyarbakir and Mardin, where the disease had been noted. Early in 1956 some of this treated wheat, instead of being reserved for planting purposes, was used for human consumption; although this originated in rural areas, it has been suggested that some of the treated wheat reached the local markets and the impression has been gained that its consumption was more widespread and continued longer than was generally admitted.

It is difficult to determine the number of cases which occurred, but the author quotes Dr. Cihad Cam, Director of the Skin Clinic in Diyarbakir, as having estimated that there may have been as many as 5,000 cases in the 3 areas involved.

The author points out that if a causal relationship with hexachlorobenzene can be established beyond doubt, this would probably be the first direct evidence for the occurrence of an acquired toxic form of porphyria in man.

H. J. O'D. Burke-Gaffney

Goffi, F. S., São Thiago, J. B., Ferrarini, E. & Silva, L. de C. Icterícia obstrutiva por granuloma blastomicótico do colédoco. Tratamento cirúrgico. **[Obstructive Jaundice due to a Blastomycotic Granuloma of the Bile Duct]** *Rev. Paulista Med.* 1960, July, v. 57, No. 1, 12–21, 6 figs. [17 refs.] English summary (6 lines).

A report of 2 cases. The agent was *Paracoccidioides* and treatment was surgical.

TROPICAL OPHTHALMOLOGY

Maythar, B. & Feitelberg, I. **[Progressive Solution of the Problem of Trachoma in Israel]** *Harefuah*. Jerusalem. 1960, Sept. 15, v. 59, No. 6 [in Hebrew 167–8. English summary 168].

The English summary appended to the paper is as follows:—

"A decreasing incidence of trachoma in 28 settlements in the Jerusalem area was noted: 1937 — 9.9%, 1958 — 3.7%, 1959 — 2.7%. The causes of this improvement are discussed under the following headings: 1) improvement in housing in 1958; 2) improvement in general education and instruction in personal hygiene by instructors and nurses of Hadassah, the Israel Government, and Kupat Holim; 3) the considerable decrease in the incidence of acute inflammations of the eye; 4) active systematic treatment in every settlement by ophthalmologists and nurses.

"The importance of the family as the main source of trachomal infection is stressed: of children with active trachoma 52.1% had one or both parents with active trachoma, 43.0% had one or both parents with cicatrized trachoma, while only 3.1% had parents with normal eyes."

GRAYSTON, J. T., YANG, Y. F., WANG, S. P., WOOLRIDGE, R. L. & JOHNSTON, P. B. **Trachoma, Studies of Etiology, Prevention and Cure.** [Abstract.] *J. Formosan Med. Ass.* 1959, Nov. 28, v. 58, No. 11, 754–6.

This paper summarizes the results of the first year's study of trachoma on Taiwan. 5 strains of trachoma virus have been isolated by yolk sac inoculation from 4 stage II patients and 1 stage III. These strains of virus fix complement with a lymphogranuloma venereum antiserum and are morphologically typical when stained by Macchiavello's method. They are non-pathogenic for ordinary laboratory animals and produce a self-limiting conjunctivitis in the monkey. With one of these strains of virus typical trachoma has been produced in blind volunteers. *S. P. Bedson*

TROPICAL ENVIRONMENTAL CONDITIONS

MALHOTRA, M. S. **Salt and Water Requirement of Acclimatized People working Outdoors in Severe Heat.** *Indian J. Med. Res.* 1960, Mar., v. 48, No. 2, 212–17, 1 graph. [10 refs.]

The author admits the need for salt supplementation for unacclimatized persons working in heat. In order to study the needs of acclimatized workers, 30 acclimatized Indians 20–25 years old were divided into test (10) and control (20) groups. Control subjects received 38 gm. salt and test subjects 19 gm. NaCl over that in the unseasoned diet. All subjects worked 7 hours daily in the sun at 95–111°F. dry bulb, 68–77°F. wet bulb shade temperatures.

Even at 19 gm. NaCl per day urine Cl concentration did not fall below 3 gm. per litre. There was no significant fall in plasma Cl or other sign of salt deficiency. Thus at 14–24 gm. per day, which is reported to be the mean intake, the salt content of the Indian dietary should be adequate even where 7 litres of sweat are secreted per day. *M. L. Thomson*

MISCELLANEOUS DISEASES

WRIGHT, F. J. **Advances in the Treatment of Tropical Diseases.** *Practitioner.* 1960, Oct., v. 185, No. 1108, 532–40. [12 refs.]

The author begins this review with the salutary advice that practitioners in Britain should be constantly on the lookout for evidence of tropical diseases

in persons who have been abroad, especially in these days of increasing and rapid communication.

He then sets out the principal advances in the treatment of such diseases in recent years. This survey covers malaria, African trypanosomiasis, the dysenteries, typhoid, rickettsial diseases, brucellosis, plague, cholera, leprosy, relapsing fever, leptospirosis, yaws, viral diseases, helminthiasis and the effects of heat. This admirable survey will be of value both as a guide for those who do not commonly encounter tropical diseases in their practice and as an *aide-mémoire* for those who do. *H. J. O'D. Burke-Gaffney*

STIRLING, G. A. **The Adrenals in Hypertensive Jamaicans.** *Trop. & Geograph. Med.* Amsterdam. 1960, June, v. 12, No. 2, 114–18.

"The adrenal cortex and its zones as well as the medulla were accurately measured to ascertain the changes occurring in hypertension and to see if there was any evidence of racial difference in adrenal make-up which may account for the high incidence of hypertension reported in the African and those of African descent.

"The increase in average adrenal weight in hypertension was small compared with the increase in the European.

"The increase, when present, was due to an increased cortical mass which could not constantly be related to any particular zone and was almost certainly a secondary rather than a primary change.

"No statistically significant increase in the size of the medulla in hypertension was noted.

"There is no evidence that a racial difference in adrenal make-up is concerned in the high incidence of hypertension reported in the African and those of African descent."

FOUCHET, VARGUES, R. & CHARMOT, G. Le syndrome splénomégalie-macroglobulinémie en pathologie tropicale. Première observation malgache. [**The Splenomegaly-Macroglobulinaemia Syndrome in Relation to Tropical Diseases. First Case Recorded in Madagascar**] *Bull. Soc. Path. Exot.* 1960, Mar.–Apr., v. 53, No. 2, 164–9, 3 figs.

See this *Bulletin*, 1958, v. 55, 1050.

BOTHWELL, T. H. & BRADLOW, B. A. **Siderosis in the Bantu. A Combined Histopathological and Chemical Study.** *Arch. Pathology.* 1960, Sept., v. 70, No. 3, 279–92, 12 figs. [38 refs.]

The authors collected liver specimens from 147 Bantu subjects who had died a traumatic death in Johannesburg, South Africa. The subjects' ages ranged between 11 and 70 years and there were 131 men and 16 women.

Siderosis was demonstrated in 89% of the specimens, which included 18% where the iron concentration was heavy, amounting to more than 1% dry weight. The chemical analysis and histological appearance agreed well. Below 0·4%

iron dry weight, the iron was mostly in the parenchymal cells of the liver; with increasing concentration it appeared in the Kupffer cells and in the portal tracts. In 50 subjects, specimens of the spleen were also obtained, and the concentration of iron was usually increased parallel with the degree of iron load in the liver. In advanced cases the iron content of the spleen tended to be higher than that of the liver. The iron concentration in the liver could be related to the presence of hepatic fibrosis or cirrhosis. All the 11 subjects with iron concentrations above 2% showed one of the two diseases, although the incidence in the group as a whole was not high—15·6% hepatic fibrosis and 1·4% cirrhosis. *H. Lehmann*

DARBY, J. P., Jr. & MENDEZ, E., Jr. **Chronic Melioidosis: Serologic Diagnosis and Antibiotic Treatment.** *U.S. Armed Forces Med. J.* 1960, Oct., v. 11, No. 10, 1203–10. [14 refs.]

FISCHER, Ann & FISCHER, J. L. **Aetiology of Kuru.** [Correspondence.] *Lancet.* 1960, June 25, 1417–18.

Many recent publications [this *Bulletin*, 1959, v. 56, 565] have provided evidence that kuru is a genetically determined disease but these authors wish to stress that there is evidence against this hypothesis. Briefly this is: (i) women in kuru-free groups have acquired the disease after marrying into the Fore Tribe; (ii) mutation rates required to explain the frequency of the disease are greater than known mutation rates for other pathological genes; (iii) on the basis of the current genetic hypothesis the disease should be inherited as commonly from paternal as from maternal grandmothers, yet in one study 15 from among 33 maternal grandmothers of kuru victims and only 2 from among 31 paternal grandmothers died of the disease; (iv) there is debate concerning whether the disease is of recent origin or not, yet its present frequency can only be explained on a genetic basis by a non-recent origin; (v) a few alleged recoveries are reported whereas recovery from a genetic disease is unlikely [it has, however, also been reported that the alleged recoveries most probably occurred in patients who had been wrongly diagnosed].

The authors conclude that a genetic basis for the disease can only be accepted if it can be shown that an extremely unstable chromosome locus and probably also a mutagenic factor exist in the Fore environment or that some selective advantage, as yet unidentified, favours those carrying kuru genes.

A. W. Woodruff

PARASITOLOGY: GENERAL

SAJEWICZ, J. Problem pasożytów jelitowych u ludności północno-wschodnich rejonów Polski. [**The Problem of Intestinal Parasites in Population of the North-Eastern Parts of Poland**] *Wiadomości Parazytologiczne*. Wrocław. 1960, v. 6, No. 1, 71–5. English summary (7 lines).

In 1958 the author investigated the incidence of intestinal parasites among the inhabitants of the province of Bielsk Podlask in Poland; 1,057 persons were examined from a total population of 70,160 (1·54%). Parasites were found in 578 (54·6%), including *Trichuris trichiura* in 426 (40·3%), *Ascaris lumbricoides* in 226 (21·4%), *Enterobius vermicularis* in 11 (1·0%) and *Giardia intestinalis* in 80 (7·5%). Among 193 persons working in various branches of the catering industry 75 were affected. *D. J. Bauer*

See also p. 150, ARENSBURGER & MARKELL, **A Simple Combination Direct Smear and Fecal Concentrate for Permanent Stained Preparations.**

GARNHAM, P. C. C. **Some Natural Protozoal Parasites of Mosquitoes with special reference to** *Crithidia*. Reprinted from *Trans. I. Int. Conf. Insect Pathology & Biol. Control*. Prague. 1958, 287–94. [21 refs.]

The author describes 3 protozoal parasites of mosquitoes and discusses their effect upon the hosts, as well as their role in the biological control of the insects in question. Most of the work upon which this communication is based was carried out by the author or his students.

One of these organisms, a gregarine *Lankesteria culicis*, parasitizes various mosquitoes of different genera, and may be pathogenic when by excessive multiplication (*e.g.* after prolonged captivity) it interferes with the vital functions of the host. Owing to this limitation, this parasite is not suitable for use in biological control. Similarly the microsporidian *Plistophora culicis*, from *Anopheles gambiae*, although capable of invading the entire body of the mosquito, does not seem to have any effect on the longevity of its host, but it has been shown to interfere with the development of oöcysts of *Plasmodium* in infected mosquitoes.

Finally, a more detailed account is given of the host-parasite relations, bionomics and taxonomy of the trypanosomid flagellate, *Crithidia fasciculata* from *Mansonia africana*. This parasite invades the entire alimentary tract of its host, it is readily cultivated in NNN medium, and proved to be infective to various other mosquitoes (*Mansonia, Aedes, Anopheles* spp.), when these are fed on culture fluid. It was shown that this flagellate has no harmful effect on its host, nor does it inhibit the development of *Plasmodium gallinaceum* in *Aedes aegypti*. Since attempts to infect various vertebrates with this *Crithidia* failed, it must be regarded as a parasite specific to mosquitoes. Its method of transmission from insect to insect is unknown, but it is suggested that adult mosquitoes acquire the infection from the nectar of flowers contaminated with the faeces of infected individuals. *C. A. Hoare*

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

CHRISTOPHERS, S. R. **The Generic Name *Aedes*.** [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, July, v. 54, No. 4, 407–8.

MACARTHUR, W. P. **The Diaeresis Sign [¨] in the Generic Name *Aedes*.** [Editorial Note.] *Ibid.*, 408.

The first author notes that the name *Aedes* was originally published, by MEIGEN in 1818, without the diaeresis. The addition of the diaeresis, by AGASSIZ in 1846, was therefore an emendation. The Rules of Zoological Nomenclature discourage such emendation except in cases of inadvertent error. The validity of the name, as spelt with a diaeresis, is doubtful. The dropping of the diaeresis on grounds of convenience, might be a useful compromise.

The second author adds that *Aedes*, as used by Meigen, is a Latinization of a Greek word meaning " odious ". The introduction of the diaeresis, which is unknown in either Greek or Latin, served the doubtful purpose of preventing confusion with the Latin word " *aedes* ", meaning " a building ", and emphasizing the three-syllable pronunciation. The correct pronunciation is now firmly established and the diaeresis should be discarded, a step taken in the *Transactions* several years ago.

[This step has now also been taken in this *Bulletin*.] *P. F. Mattingly*

SENEVET, G. & ANDARELLI, L. Contribution à l'étude de la biologie des moustiques en Algérie et dans le Sahara algérien. **[Observations on Biology of Mosquitoes in Algeria and in the Algerian Sahara]** *Arch. Inst. Pasteur d'Algérie.* 1960, June, v. 38, No. 2, 305–26. [17 refs.]

FOX, I. & BERMAN, N. S. **A Preliminary Report on Biting Mosquitoes in Puerto Rico together with some Experimental Work on Natural and Acquired Sensitivity of Man to Insect Bites.** *Bol. Asoc. Med. de Puerto Rico.* 1960, Mar., v. 52, No. 3, 89–94. [11 refs.]

Among the haematophagous insects of Puerto Rico, *Culex quinquefasciatus* [*fatigans*], *Aedes taeniorhynchus*, *Aedes sollicitans* and *Culicoides furens* are the most important. During a 6-month period in 1957, a survey of 752 persons (most of them continentals who had been on the island from a few weeks to 3 years) showed that 17% reacted strongly to mosquito bites, 13% did not react at all and 70% reacted mildly. About 30% of children under 10 were severe reactors while only 10% of the adults were severe reactors. The commonest symptoms of bite were redness, itching and swelling. Highly allergic persons did not react to the bites of the 4 species concerned to the same degree, and there is some evidence to show that *Culicoides* midges and not mosquitoes cause the severest reactions in Puerto Rico.

Trials with antigens made from whole bodies of *C. quinquefasciatus*, *Aedes taeniorhynchus* and *C. furens* showed that a positive reaction to a specific whole body antigen did not necessarily indicate a reaction on the part of the subject to the bite of the particular species.

The results are summarized in 3 tables. *M. G. R. Varma*

CORBET, P. S. **Recognition of Nulliparous Mosquitoes without Dissection.** [Correspondence.] *Nature*. 1960, Aug. 6, v. 187, 525–6.

The author has considered the possibilities of recognizing young mosquitoes that have not laid eggs (nulliparous) by external characters, such as the amount of external wear, by the presence of parasitic mites [this *Bulletin*, 1958, v. 55, 105], and by colour changes during life, and has compared his results from the application of these methods with the results obtained by dissecting out the ovaries and examining them for follicular relicts.

Once the minimum amount of external wear associated with the first oviposition was recognized by experience with each species, it was then possible to classify the mosquitoes as nulliparous or parous on this character. Only 0·9% out of 938 females of *Mansonia metallica* and 0·1% out of 946 *M. fraseri*, classified as nulliparous from the amount of external wear, were found to be parous when the ovaries were dissected. Some females were classified as "doubtful" and of these 43·1% and 42·0% were found to be parous when dissected. Greater familiarity with each species, however, reduced these errors. Denuding of the abdominal sternites was found to be the best guide in *Mansonia*, subgenus *Coquillettidia*, but wing fray proved to be more reliable in *Mansonioides* and *Aedes*.

Examination of mosquitoes for the presence of parasitic hydrachnid mites showed that, whereas female mosquitoes carrying living mites are almost always nulliparous, parous mosquitoes may carry dead mites, or mites that are not hydrachnids. Once living hydrachnids are recognized, then this method has proved valuable as a method of recognizing nulliparous mosquitoes.

Colour changes in the thoracic pleurae of *M. pseudoconopas* from apple green (0% parous) to brownish-yellow in older mosquitoes (27·6% parous) have also provided a method for recognizing nulliparous females. In addition the size of non-hydrachnid mites on the body of *M. pseudoconopas* was found to be useful in age-grading the females. Less obvious colour changes have also been observed in other species of *Mansonia*, subgenus *Coquillettidia*, and also in *Anopheles implexus*, *Culex tigripes* and *C. annulioris*.

The author also records that up to 34% of nulliparous *M. fraseri* still retained the meconium visible in the gut through the abdominal skeleton, and that the resilience of the abdomen, and the amount of fat in the abdomen, may also be used in distinguishing nulliparous from parous females. In *Coquillettidia* discs of fat in the abdomen usually disintegrate before the first blood meal, and in *Eretmapodites* and *Toxorhynchites* during the first gonotrophic cycle.

[For previous references on age-grading mosquitoes, see *ibid.*, 1959, v. 56, 245, 271.] *B. R. Laurence*

DOWNE, A. E. R. **Blood-Meal Sources and Notes on Host Preferences of Some *Aedes* Mosquitoes (Diptera: Culicidae).** *Canadian J. Zool.* 1960, Aug., v. 38, No. 4, 689–99. [26 refs.]

"Blood meals of engorged female *Aedes* mosquitoes collected from animal dwellings, light traps, and hand catches were identified by serological precipitin tests. The mosquitoes had fed on farm animals, humans, rodents, raccoons, deer, and probably foxes. Very few of the specimens had fed on birds and few contained the blood of more than one kind of host. Preliminary studies in a screened enclosure in a one-room barn that contained various combinations of domestic animals and humans indicated that a preference shown by mosquitoes for a mammalian host is related to the surface area of the host."

STOBBART, R. H. **Studies on the Exchange and Regulation of Sodium in the Larva of *Aedes aegypti* (L.). II. The Net Transport and the Fluxes associated with it.** *J. Exper. Biol.* 1960, Sept., v. 37, No. 3, 594–608, 7 figs.

See this *Bulletin*, 1960, v. 57, 422.

FOX, I., BOIKE, A. H., Jr. & GARCIA-MOLL, Ileana. **Notes on Rock Hole Breeding and Resistance of *Aedes aegypti* in Puerto Rico.** *Amer. J. Trop. Med. & Hyg.* 1960, July, v. 9, No. 4, 425–9, 6 figs. [14 refs.]

This paper adds further information to the report of double resistance (to DDT plus dieldrin) discovered in *Aedes aegypti* in Puerto Rico [see this *Bulletin*, 1960, v. 57, 1224]. In the course of a survey of *Aedes aegypti* incidence in Puerto Rico in 1959, larvicidal control measures with DDT and dieldrin were begun along the coast of the Bay of Aguadilla. Failure to eliminate the mosquito led to more intense searches and revealed extensive breeding in rock pools, some of which were difficult to discover owing to overhanging vegetation. This breeding of *Aedes aegypti* in rock pools is contrary to general experience of the mosquito in the New World, where it has been generally found to breed in artificial containers close to human dwellings.

Larvae from these rock pools were colonized in the laboratory and the F_3 generations subjected to insecticidal tests; these revealed that some of the populations had high levels of resistance to DDT and also to dieldrin and lindane. There was also moderate resistance to malathion, diazinon and trichlorphon (Dipterex) but not to Baytex.

Comparative tests of larvae from other sites along the north coast of Puerto Rico, also revealed resistance to DDT and dieldrin and it is concluded that this phenomenon, together with the pool breeding, will hinder *Aedes aegypti* control in the island.

[WOOD (*ibid.*, 1960, v. 57, 422) reports on an analogous change in breeding sites by *Aedes aegypti* in Trinidad, also accompanied by resistance to DDT, but not to dieldrin. The exact significance of the apparent change of oviposition habit and insecticide resistance is not yet clear.] *J. R. Busvine*

VARGAS, L. & DÍAZ NÁJERA, A. *Haemagogus* mexicanos (Insecta, Diptera). Claves para su identificación. [**Keys for the Identification of Mexican Species of** *Haemagogus*] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, Dec., v. 19, No. 4, 361–4, 1 fig.

VARGAS, L. & DÍAZ NÁJERA, A. Descripcion del macho de *Sabethes* (*Sabethes*) *belisarioi* Neiva, 1908. Nueva especie para México (Insecta: Diptera). [**Description of the Male of** *Sabethes belisarioi*, **a New Record for Mexico**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, Sept., v. 19, No. 3, 299–308, 14 figs. English summary (9 lines).

HARWOOD, R. F. & HALFHILL, J. E. **Mammalian Burrows and Vegetation as Summer Resting Sites of the Mosquitoes** *Culex tarsalis* **and** *Anopheles freeborni*. *Mosquito News*. 1960, June, v. 20, No. 2, 174–8, 2 figs.

RAMAKRISHNAN, S. P. & MOHAN, B. N. **Distension of the Abdomen of** *Culex fatigans*, **a Sign of Acute Poisoning by Gamma BHC.** *Indian J. Malariology* . 1959, Dec., v. 13, No. 4, 189–97, 2 figs. on pl.

Exposure of susceptible female *Culex fatigans* to dosages of gamma BHC producing a high mortality in a short time of exposure resulted in many of the dead mosquitoes showing an abdomen grossly distended, due to the presence of air in both the alimentary canal and in the oesophageal diverticula. Exposure of a strain of the same species, resistant to DDT and gamma BHC [this is described as cross-resistance; the more correct term would be multi-resistance] to much higher dosages of gamma BHC resulted in far fewer of the killed mosquitoes showing such distension.

The authors suggest that this phenomenon might be used to distinguish susceptible from resistant individuals in mixed populations. *G. Davidson*

LAIRD, M. **Microbiology and Mosquito Control.** *Mosquito News*. 1960, June, v. 20, No. 2, 127–33. [Numerous refs.]

KELLEN, W. R. **The Control of Mosquitoes by Pathogenic Microorganisms.** *Mosquito News*. 1960, June, v. 20, No. 2, 133–5. 1 fig.

Both these papers review in general terms the possibility of using micro-organisms pathogenic to mosquitoes as a method of control. In the paper by Laird there is a reference to a current experiment, in an isolated group of South Pacific atolls, the Tokelau Islands, to establish the fungal parasite of mosquitoes, *Coelomomyces stegomyiae*, in a previously uninfected population of *Aedes polynesiensis*. *B. R. Laurence*

KELLEN, W. R. & LEWALLEN, L. L. **Response of Mosquito Larvae to** *Bacillus thuringiensis* **Berliner.** *J. Insect Pathol.* New York. 1960, Sept., v. 2, No. 3, 305–7.

"A conclusion is indicated that the commercially produced materials tested are unsuitable for the economic control of *Aedes nigromaculis*, *Culex tarsalis*,

and *C. pipiens quinquefasciatus*. It is conceivable, however, that a new strain of *B. thuringiensis* may be developed which will offer greater toxicity to these species of mosquitoes."

LEWIS, D. J., REID, E. T., CROSSKEY, R. W. & DAVIES, J. B. **Attachment of Immature Simuliidae to other Arthropods.** [Correspondence.] *Nature*. 1960, Aug. 13, v. 187, 618–19.

Records are given of eggs and larvae of *Simulium* on dragonfly larvae in Southern Rhodesia and Nigeria. Larvae of *S. medusaeforme* form *hargreavesi* were found on Libellulid larvae near Lokoja in Nigeria and eggs of a species of *Simulium*, possibly *S. adersi*, were found on a larva of *Aeschna* near Salisbury in Rhodesia. The larvae that hatched from these eggs were similar to a single larva obtained from a freshwater crab in the same district.

It is suggested that dragonfly larvae and other aquatic animals should be examined for this sort of association, which may be accidental but which may indicate how the Simuliid-freshwater crab association of the *S. neavei* complex arose [this *Bulletin*, 1951, v. 48, 181]. *B. R. Laurence*

i. WATTAL, B. L., MAMMEN, M. L. & KALRA, N. L. **A Simple Medium for Laboratory Rearing of Housefly *Musca domestica nebulo* Fabricius, with some Observations on its Biology.** *Indian J. Malariology*. 1959, Dec., v. 13, No. 4, 175–83, 1 fig. & 1 graph.

ii. WATTAL, B. L. & MAMMEN, M. L. **A Preliminary Note on Colour Preference for Oviposition of *Musca domestica nebulo* Fabricius.** *Ibid*., 185–7, 1 fig.

i. The adult flies are kept in muslin cages supported on a wire framework, and provided with a cotton pad soaked in dilute milk powder, for food. The temperature is not maintained constant, but the rearing room is cooled by blocks of ice in summer and warmed by an electric heater in winter.

Eggs laid on the milk-soaked cotton pad are transferred to the rearing medium, which consists of 4 oz. cotton-seed cake soaked in 8 oz. water overnight, and placed in an 8 in. diameter earthenware bowl. Complete development takes 8–10 days in summer and 16–20 days in winter. The rate of development, fecundity and length of life of flies reared in this manner compare quite well with those reared on a more complex medium [DEORAS, *Parasitology*, 1954, v. 44, 304; this *Bulletin*, 1955, v. 52, (221)].

ii. The second paper describes tests in which cotton-wool pads for oviposition were wrapped in moist cotton cloths of different colours. 4 replicates of 9 colours were exposed to a large cage of flies for 24 hours and the eggs subsequently counted (total 9,112). Significantly greater numbers of eggs were found to have been laid on the black cloth (40% of total). The percentages on other colours were: deep red 14%; light brown 11%; dark brown 10%; white 8%; light red 6%; green 6%; blue 4%; yellow 2%. *J. R. Busvine*

Saccà, G. & Benetti, M. P. Ricerche sperimentali sulla maturità e sul comportamento sessuale di *Musca domestica* L. (Diptera, Muscidae). **[Experimental Researches on the Maturity and the Sexual Behaviour of *Musca domestica* L. (Diptera, Muscidae)]** *Rendiconti Istituto Superiore di Sanità*. Rome. 1960, v. 23, Pt. 5, 423–32, 3 figs. [20 refs.] English summary (7 lines).

Rivosecchi, L. Osservazioni teratologiche su alcuni esemplari di *Musca domestica* L. raccolti in provincia di Latina. **[Teratological Observations on some Specimens of *Musca domestica* L. collected in the Province of Latina]** *Rendiconti Istituto Superiore di Sanità*. Rome. 1960, v. 23, Pt. 5, 449–81, 7 figs. & 3 pls. [52 refs.] English summary (6 lines).

Wiesmann, R. Zum Nahrungsproblem der freilebenden Stubenfliegen *Musca domestica* L. **[Feeding Habits of *Musca domestica*]** Reprinted from *Ztschr. f. Angewandte Zool.* 1960, v. 47, 159–81, 11 figs. [24 refs.]

The failure of many of the residual contact insecticides to kill flies, owing to resistance, has revived interest in poison baits as a control method. This is one reason for investigating the feeding habits of wild flies, about which comparatively little is known.

In this investigation, flies were captured in various places and their crop contents (usually in batches of 10) analysed by paper chromatography. Not only were amounts of sugars, amino-acids, proteins and lipoids roughly assessed, but further tests distinguished between several different sugars: fructose, glucose, saccharose, lactose and an unknown polysaccharide. Practically all the flies caught contained sugars; in most of them, amino-acids and protein were present, while lipoids occurred to a smaller extent. The spectrum of different sugars found in the flies bore close resemblance to those present in the food supplies available to the adults. In cattle sheds, this was mainly spilt milk; in piggeries, it was pig food; and in farm houses, it was mainly household sugar. A few tests with other wild flies showed interesting contrasts. Thus, lactose, which was common in house-flies which had access to milk, was absent from the wild diptera. These always contained fructose and glucose, which they had converted enzymatically from the saccharose present in plant nectar. In an analogous way, house-flies sometimes contained maltose and glucose derived from starchy materials, metabolized by enzymes in their saliva.

With regard to detection of sugars by flies, the author repeats certain experiments, made by earlier authors with blowflies, and shows that the tarsi are sensitive to sugar and that they carry enzymes capable of metabolizing saccharose, maltose and starch.

In experiments made to show the essential role of sugar in fly nutrition, it was found that the short adult life of flies fed only on casein and water could be tripled by addition of saccharose or by bread or milk plus sugar. Protein, however, was necessary for egg laying.

Partly starved flies recovered rapidly when fed on saccharose, fructose or glucose; fairly soon after raffinose, maltose or lactose; and rather slowly after galactose. *J. R. Busvine*

WIESMANN, R. Neue Mittel und Methoden zur Fliegenbekämpfung im Stall. [**New Materials and Methods for Control of Flies in Stables**] Reprinted from *Schweiz. Arch. f. Tierheilk.* 1960, v. 102, No. 3, 134–46, 3 figs. [19 refs.]

Resistance to chlorinated residual contact insecticides poses a difficult problem for fly control. The author suggests that poison baits may provide a solution, even when there is some degree of resistance to the toxicant used. Thus, a fly crawling on a residual deposit may pick up 10 μ of insecticide, of which some 6 to 8 μ might penetrate into the body within 6 to 10 hours. In contrast, a fly may drink 1 mm.^{3} of a bait; and with a 6% solution, this would introduce 60 μ into the body.

Sugar is known to be an attractive substance for flies and a water-soluble poison would mix well with it. Such a compound is dimetilan which is a carbamate insecticide (2-dimethyl-carbamyl-3-methyl-pyrozolyl-(5)-dimethyl carbamate). The acute oral toxicity of this for rats and mice is LD50 47 and 50 mgm./kgm. respectively. Tests on normal flies gave an LD50 by mouth of 0·1 and by contact 0·44 μgm. per fly. Doses for a resistant strain were about 3 to 10 times as high.

For use in practice, dimetilan is spread as a paste with sugar on strips of foam rubber 2 m. long and 3–4 cm. wide. These were tested in cattle sheds and piggeries, being strung horizontally in a position where the flies would rest on them. They were coloured red, which seemed to make them more attractive.

Control began at once and within 24 to 36 hours practically all flies were destroyed. The treated ribbons remain effective for 4–5 months. They were not effective against stable flies (because these do not lick sugar baits) but were useful in controlling cheese skippers (*Piophila casei*) in cheese stores.

Their moderately high toxicity to mammals makes it desirable for veterinarians to give injections of atropine if animals eat part of the treated strips. *J. R. Busvine*

MER, G. G. & PAZ, M. **Control of House-Flies in Rural Areas by means of Traps.** *Riv. di Parassit.* Rome. 1960, June, v. 21, No. 2, 143–50, 2 figs.

In this paper, field trials in Israel with baited fly traps are described. The fly trap, constructed of wire netting, consists of two cones: the outer cone reaches a height of 35 cm. and is closed above and below and surrounds an inner cone (height 12 cm.), the apex of which opens into the cavity enclosed by the outer cone; the bottom of the inner cone is also open. The whole structure is elevated a few inches above ground level and the bait is placed in a dish on the ground opposite the lower opening of the inner cone. The bait was formulated as follows: 250 gm. of yeast were added to 1·5 litres of tap water which was allowed to stand at room temperature for 3 days; 10 gm. of ammonium carbonate were then added. The bait retained its attractive properties for a "long time" in sealed jars, and under field conditions was effective for at least 24 hours. The bait proved attractive to house-flies, lesser house-flies (*Fannia canicularis*) and a number of different blowflies. Data are provided on sex and physiological condition of flies attracted to the bait.

The major field trial with baited traps was carried out over a period of 17 days on a "kibbutz" [collective farm] where sanitation was poor. During the course of the trial over one million flies were caught in 15 strategically placed traps (the bait being changed daily). Population density counts suggested that the traps were effective in reducing the over-all fly population. Two days after the traps were set up the population density was reduced by 50%. Towards the end of the experiment it appeared that some equilibrium was being established between the size of the fly population and the number of flies trapped.

Further evidence of the effectiveness of the traps in the control of flies was gained from the fact that two days after the conclusion of the trial there was a noticeable increase in the number of flies although the breeding conditions had remained unchanged. *B. C. Fine*

WARD, J., GILLHAM, E. M. & POTTER, C. **A Thermal Preference Method of Bioassay of the Toxicity of Insecticidal Films to House-Flies.** *Bull. Entom. Res.* 1960, July, v. 51, Pt. 2, 379–87, 4 figs.

This technique was developed for testing the insecticidal powers of residues of DDT or other insecticides in the laboratory. Certain other methods are described and their limitations discussed; one of the common difficulties was to make the test insects remain on the treated surface. This is ensured, in the apparatus described here, by a thermal preference. The treated surfaces (glass plates, or cabbage leaves fastened to them) are warmed to about 30°C. by laying them on a warmed brass plate. The test insects are confined on them by a chamber comprising a brass cylinder 6·5 cm. diameter and 1·7 cm. deep, to the outside of which a 2–loop spiral of copper tube is soldered. This is covered by a Perspex plate with a hole through which the test insects can be introduced by a plunger device. In use, the brass cylinder is cooled by circulating ice water. The top of the chamber is also cooled by a dish of ice, after removal of the plunger. The test insects used, which were house-flies, kept off the cool parts of the chamber and walked only on the treated surfaces. (It is suggested that other insects could be used, *e.g. Blattella germanica.*)

The paper records the results of tests with DDT deposits from suspensions or oil solutions. Some data are for varying times for a constant deposit; but, generally, a constant time and variable deposit are recommended. Transferred to probit/log dose curves, the results gave straight, steep regression lines with comparatively little heterogeneity. *J. R. Busvine*

KANO, R., OKAZAKI, T., UTSUMI, K. & HAGI, K. **Notes on Flies of Medical Importance in Japan. Part XV. Finding of *Calliphora subalpina* (Ringdahl, 1931) in the Mountains of Honshu, Japan.** *Bull. Tokyo Med. & Dental Univ.* 1959, Sept., v. 6, No. 3, 413–14, 4 figs. on pl.

DONNELLY, J. **The Effect of Gamma Radiation on the Viability and Fertility of *Lucilia sericata* Mg. (Dipt.) irradiated as Pupae.** *Entomologia Exper. et Applicata.* Amsterdam. 1960, Mar., v. 3, No. 1, 48–58.

Successful eradication of the screw-worm, *Callitroga hominivorax* has been accomplished in the island of Curaçao by the release of individuals rendered

sterile by irradiation [this *Bulletin*, 1956, v. 53, 1395]. The present paper describes the effects of irradiation of the pupal stage of the sheep maggot fly, *Lucilia sericata*, a species ecologically similar to the screw-worm.

Pupae of the flies were irradiated with cobalt 60, the dose rates being 6,000 r per hour and 25,000 r per hour. Pupae more than one-third developed emerged normally up to 12,000 rep, with a 24% reduction in emergence at 24,000 rep. Adult longevity appeared to be reduced from 1,000 rep upwards and this effect increased with increasing doses. Males were slightly more resistant to irradiation, requiring more than 3,000 rep for complete sterilization, whereas females were effectively sterilized at 3,000 rep. Males irradiated at doses up to 24,000 rep still produced apparently morphologically normal sperms in normal amounts and the progressive decrease in male fertility over a dosage range 0–3,000 rep is probably the result of a reduction in the percentage of fertile sperms produced. In the case of irradiated females, increasing dosages progressively reduced the percentage viability of eggs without affecting the total egg output. However, at dosages beyond 3,000 rep the females did not lay any egg clusters at all. *M. G. R. Varma*

Taufflieb, R. Notes sur les puces d'Afrique Équatoriale, principalement de la région de Brazzaville. [**Notes on the Fleas of Equatorial Africa, especially in the Brazzaville Area**] *Bull. Inst. Études Centrafricaines.* (n.s.) 1960, Nos. 19/20, 85–90.

Comparatively little has been published on the fleas of the Congo region, so it was considered worth while putting on record the following notes regarding collections made mainly in the area of Brazzaville. 9 species were collected. Generally the fleas were more common in the dry season and became rare during the rains.

Ctenocephalides felis strongylus is common on dogs and rare on rodents. It sometimes bites man.

Echidnophaga gallinacea is common near Brazzaville and on the Batéké plateau to the north and is mainly found on dogs. Poultry are not common hosts, but carry large numbers of parasites when they are infested. Though this flea is rare on rodents, one rat carried 41 specimens.

Tunga penetrans was common in Brazzaville up to 1952 in the dry season, but the extensive use of insecticides in houses during antimalaria campaigns has rendered it rare. It is still found over a wide area, however.

Pulex irritans is a palearctic species. It reached Dakar in 1949 and took 7 years more to spread to the Congo despite the extensive air and sea transport between the two regions. It spread widely in African villages near Brazzaville and attacks dogs as well as man. It is not known whether it occurs in neighbouring states.

Lagaropsylla idae and *L. consularis* were taken from bats.

Xenopsylla cheopis is common on the domestic rodents *Rattus frugivorus* and *R. alexandrinus*. However, the mean annual index per rat is low (0·6); though it may rise somewhat in the dry season, it appears to be below the level which threatens outbreaks of plague. This flea is an urban species, rare on wild rodents, except for *Mastomys coucha*; but this is a semi-domestic animal.

X. braziliensis also occurs on commensal rats, though it is less abundant than *X. cheopis*. It is found more often in villages than in towns; but it is even less common on wild rodents than *X. cheopis*.

Libyastus consobrinus is mentioned by SMIT (*Rev. Zool. Bot. Africaines*, 1958, v. 57, 1) as found in this region, though not observed by the author.

J. R. Busvine

JANION, S. M. **Flea Infestation of Three Species of Mice,** *Clethrionomys glareolus, Apodemus agrarius* **and** *Apodemus flavicollis* **during Particular Weeks of their Occurrence in the Experimental Area.** *Bull. Acad. Polonaise des Sci.* Warsaw. Sér. Sci. Biol. 1960, v. 8, No. 8, 363–7, 2 figs.

KUMADA, N. & SAKAGUTI, K. **A New Flea of the Genus** *Frontopsylla* **from Japan (Siphonaptera: Amphipsyllidae).** *Bull. Tokyo Med. & Dental Univ.* 1959, Sept., v. 6, No. 3, 417–20, 12 figs.

DESCHIENS, R., DEPOUX, R., LEVADITI, J. & MOUTRILLE, M. Infestation d'un fibrome cutané pédiculé par la puce chique. [**Infestation of a Pediculated Cutaneous Fibroma with** *Tunga penetrans*] *Bull. Soc. Path. Exot.* 1960, Mar.–Apr., v. 53, No. 2, 148–9, 2 figs. on pl.

HUDSON, B. W., FEINGOLD, B. F. & KARTMAN, L. **Allergy to Flea Bites. II. Investigations of Flea Bite Sensitivity in Humans.** *Exper. Parasit.* New York. 1960, June, v. 9, No. 3, 264–70. [12 refs.]

Examination of impounded dogs and cats in the San Francisco Bay area revealed infestations almost exclusively of *Ctenocephalides felis*. Inspection of 9 dwellings reported infested showed 5 with *Pulex irritans* and 2 with *Ct. felis*.

Flea bite tests were made on people attending a clinic for unknown allergies, with the use of *Ct. felis*, *P. irritans* and *P. simulans* [this *Bulletin*, 1959, v. 56, 438]. The signs and symptoms of bite reaction are described. Briefly, there is sometimes an immediate wheal or erythema and, more commonly, a delayed (24-hour) induration, with papule or vesicle or erythema or combinations of all 3. Rather more males reacted than females, especially to the delayed effect (51% and 32% respectively with *P. irritans*). Young people of either sex (under 10 years) reacted more than older ones. A comparison of the response to the three different test fleas showed distinct correlation, so that those positive for one species were most likely to be positive for others. This contrasts with response to bites of *Aedes aegypti* and *Anopheles quadrimaculatus*, to which 2 species sensitivity showed no correlation (ROCKWELL and JOHNSON, *J. Investigative Dermatol.*, 1952, v. 19, 137).

[For Part I, see this *Bulletin*, 1960, v. 57, 961.] *J. R. Busvine*

GOLDSTEIN, N. P., RUCKER, C. W. & WOLTMAN, H. W. **Neuritis occurring after Insect Stings.** *J. Amer. Med. Ass.* 1960, Aug. 13, v. 173, No. 15, 1727–30, 1 fig.

"In three patients neuritis occurred after the sting of an insect. None of the patients was considered to be of an 'allergic disposition'. In one instance papilledema arose; in the second patient neuritis of an upper extremity developed; and in the third patient neuritis involved the first and second divisions of the trigeminal nerve. In each case the involved nerve was in proximity to the location of the insect sting. It is postulated that these are examples of an 'allergic neuritis', with some similarity to the neuritis of a delayed serum reaction after the administration of an antitoxin. Two of the three patients noted spontaneous abatement of the neuritis after a time."

TIPTON, V. J. **The Genus Laelaps. With a Review of the Laelaptinae and a New Subfamily Alphalaelaptinae (Acarina: Laelaptidae).** *Univ. California Publ. Entom.* 1960, v. 16, No. 6, 233–356, 26 pls. [Numerous refs.]

BRENNAN, J. M. & JONES, Eleanor K. **Chiggers of Trinidad, B.W.I. (Acarina: Trombiculidae).** *Acarologia.* La Varenne. 1960, Oct., v. 2, No. 4, 493–540, 23 figs. [15 refs.]

LUMBRERAS, H. Über das Vorkommen der Reduviiden *Eratyrus mucronatus* Stal, 1859, und *Rhodnius ecuadoriense* Lent & Leon, 1958, in Peru und eine erneute Beschreibung dieser Arten. [**The Presence of the Reduviids** *Eratyrus mucronatus* **and** *Rhodnius ecuadoriense* **in Peru and a Revision of these Species**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1960, v. 11, No. 2, 213–22, 3 figs. [Numerous refs.]

ABBASSIAN-LINTZEN, Rosemarie. **A Preliminary List of Ticks (Acarina: Ixodoidea) occurring in Iran and their Distributional Data.** *Acarologia.* La Varenne. 1960, Jan., v. 2, No. 1, 43–61, 8 figs. [Numerous refs.]

This catalogue of Iranian ticks is based on the examination of 41,644 specimens, most of them collected from stables, human dwellings and domestic animals. A total of 26 species belonging to 8 genera are listed and short notes are given on the hosts, distribution (vertical and altitudinal) and the climatic conditions of the localities from which ticks were collected: *Argas persicus* and *A. reflexus* were taken from chicken houses and pigeon houses, respectively, and both are recorded as attacking man. Of the 5 species of *Ornithodoros* listed (*erraticus, lahorensis, tartakovskyi, canestrinii* and *tholozani*), only *tholozani* attacks man frequently, a factor of considerable significance, since this tick is the vector of human relapsing fever in Iran. Among the hard ticks, adults of *Boophilus annulatus* were common on cattle and sheep, but nymphs were only rarely observed. *Dermacentor* was represented by a single species, *marginatus.* Although 5 species of *Haemaphysalis—concinna, erinacei, inermis,*

punctata and *sulcata*—are listed, *Hyalomma* was the most common of all the ixodid ticks with 7 species, *aegyptium, detritum, dromedarii, excavatum, rufipes glabrum, savignyi* and *schulzei*. The genus *Ixodes* is represented by *crenulatus, ricinus* and an unidentified species collected from a jackal and *Rhipicephalus* by the species *bursa* and *sanguineus*.

Three species which Soviet workers reported from Iran, but which the author could find no records of, are *Ixodes vespertilionis, Haemaphysalis caucasica* and *Dermacentor niveus*. Eight maps in the text give the approximate range or the collecting localities or both of the various species.

[The host records, in particular of the immature stages, are probably far from complete. Most of the records pertain to the adult stages and a few to the nymphs.] *M. G. R. Varma*

DAVIDSON, G. **Insecticides.** Ross Institute Industrial Advisory Committee: Information and Advisory Service. London School of Hygiene and Tropical Medicine. Bull. No. 1, re-written February, 1960 (originally issued May, 1949, revised March, 1952, re-written June, 1955), 35 pp., 2 figs. [16 refs.]

This booklet is written to give sound practical instruction together with basic information about the nature of various insecticides and their mode of action. The previous edition [this *Bulletin*, 1955, v. 52, (1244)] has been carefully revised and enlarged (by about 25%) to include knowledge gained from experience and research of the past 5 years. In particular, details of the new, safe organo-phosphorus insecticides are included and there is also a useful section on precautions in the use of insecticides in residual spraying operations. The general considerations of vector control have been revised in the light of modern ideas of disease eradication. There is also an explanation of the phenomenon of resistance, an appraisal of its seriousness and several references to its importance in regard to particular arthropods.

Additions have been made to the specific recommendations for control of various pests, namely: scorpions, ants and termites. There is also a new section on repellents. *J. R. Busvine*

BROWN, A. W. A. & MARCH, R. B. [Editors.] **Insecticide Resistance in Arthropods of Medical and Veterinary Importance. A Symposium held by the Entomological Society of America Sect. D. (Med. & Vet. Entom.) at 6th Annual Meeting, Salk Lake City, Utah, Dec. 2, 1958.** *Misc. Pub. Entom. Soc. Amer.* 1959, Oct., v. 1, No. 1, 1–32, 3 figs. [Numerous refs.]

The first paper (*Resistance in Arthropods of Medical and Veterinary Importance*—1946–48, by H. F. SCHOOF pp. 3–11) outlines the growth of resistance up to 1958 and discusses some of the most recent instances. He notes the increase in resistance among mosquitoes and also that a few strains of insects are showing resistance to more than one group of insecticides. [Both these tendencies continue, to date.] R. B. MARCH (*Resistance to Organophosphorus Insecticides*, pp. 13–19) discusses resistance to organo-phosphorus compounds in the house-fly [*i.e.* the only insect in which it has been carefully studied]. He contrasts the ways in which organo-phosphorus resistance differs

from that to DDT or the BHC/dieldrin group. The latter develops continuously, under laboratory pressure, to very high levels where no application can kill, presumably because of absorption limitations. Once developed, there is generally cross-resistance to related chlorinated insecticides, but not to organo-phosphorus compounds. Laboratory colonies lose their resistance only slowly, in the absence of selection. In contrast, organo-phosphorus resistance does not generally reach the high levels where absorption limits toxicity. Cross-resistance to other organo-phosphorus compounds is sporadic; but high resistance to chlorinated compounds is induced. Finally, resistance is soon lost on removal of selection pressure.

Biochemical mechanisms of resistance are discussed, and a survey of the available data leads the author to believe in detoxication as the principal defence (rather than higher levels of cholinesterase activity, cholinesterase less susceptible to inhibition, or reduced activity of toxifying systems).

Professor A. W. A. Brown (*Inheritance of Insecticide Resistance and Tolerance*, pp. 20–26) summarizes current views on genetics of resistance. He points out that dosage-mortality curves for segregating generations would tend to be steeper according to the numbers of genes involved. This would be consistent with the flattening of the slopes observed as true (commonly single-gene) resistance develops; whereas vigour tolerance (multigenic) is expected to cause a shift in the curve, without change of slope. Various examples of resistance inheritance are discussed, without omitting anomalous results.

The final paper (*Changes in Reproductive Potential in House Flies in Response to Dieldrin* by Professor H. Knutson, pp. 27–32), discusses various biological characteristics which may be found to differ in resistant and normal strains of insects. The survey covers essentially behaviour differences, morphological changes and alterations in reproductive potential. [Unfortunately no clear distinction is made between effects of treatment by insecticides and genotypic differences between normal and selected strains. The survey is, accordingly, somewhat confused.] Some work of Knutson and colleagues concerned samples of flies taken from a treated ranch, over a period of 3 years, with 5 dieldrin treatments. The overall reproductive potential of the flies (adult progeny per female) was found to vary considerably, but not progressively; and it was throughout very much less than that of laboratory colonies, both resistant and normal. *J. R. Busvine*

LABORATORY PROCEDURES

Kohn, J. **[A One Stage Permanent Staining Method for Faecal Protozoa]** *Dapim Refuiim*. Tel-Aviv. 1960, July, v. 19, Nos. 2/3 [in Hebrew 160–61, 3 figs. on 2 pls. English summary iv–v].

The English summary appended to the paper is as follows:—

"Usual methods of staining of protozoa proceed in three stages—fixation, staining and differentiation. The method described here combines all three stages into one, in one staining solution composed of:

" *Basic solution* I.	Chlorazol black (G.T. Gurr)	5 gm.
II.	Ethyl alcohol 90%	170 ml.
	Methyl alcohol	160 ml.
	Glacial acetic acid	20 ml.
	Phenol liquefied	20 ml.
	Phosphotungstic acid 1%	12 ml.
	Water distilled	to 1000 ml.

" Chlorazol black is dissolved while well ground in a mortar in small amounts of basic solution (II) and the dissolved portions poured off into a glass vessel. There, it is left to age for several weeks; during this time the suspension separates into cherry purple clear supernatant and sediment. The supernatant is used for staining, usually overnight. Material stained on cover slips is then dried, cleared by xylol and mounted.

" Protozoa stain black or dark grey on a light grey background. Cellular structures are black while cytoplasm stays colorless. Both vegetative forms and cysts stain well. Chromidial bodies stain very intensely. Cytoplasm of Entameba coli stains often pink. In histological sections muscle, keratin and red cells stain red."

MANSOER, T. A. & LAARMAN, J. J. **An Effective Concentration Method for the Detection of Protozoal Intestinal Infections.** *Trop. & Geograph. Med.* Amsterdam. 1959, Dec., v. 11, No. 4, 361–75, 3 figs.

The authors describe in detail the comparative efficiency of a number of methods for concentration of human protozoal cysts in stools by precipitation. Faecal material for these tests contained *Entamoeba histolytica, E. coli* and *Giardia.*

The best results were obtained with the Schüffner-Laarman method, in which the following simplified modification of Bayer's fluid, devised by the authors themselves, is used: cupric acetate 0·4 gm., cupric chloride 0·4 gm., glacial acetic acid 0·76 ml., distilled water up to 200 ml. The procedure is as follows: (1) a faecal sample about the size of a pea is suspended in a centrifuge tube in 3 ml. of water, (2) modified Bayer's fluid is added to about 2 cm. below the rim, and the mixture is shaken slightly, (3) 0·5–1 cm. of benzene is added to the suspension, and the mixture is shaken vigorously for 1 minute; (4) the centrifuge tube is filled up to the rim with simplified Bayer's fluid, (5) the tube is left to stand for 5 minutes, until all detritus rises to the surface, (6) detritus is flicked off, (7) the mixture is centrifuged for 3–5 minutes at 2,500 r.p.m., (8) supernatant fluid is pipetted off, and sediment is examined after addition of a few drops of Lugol's solution or carbol thionin.

[See also this *Bulletin*, 1956, v. 53, 1188.] *C. A. Hoare*

ARENSBURGER, K. E. & MARKELL, E. K. **A Simple Combination Direct Smear and Fecal Concentrate for Permanent Stained Preparations.** *Amer. J. Clin. Path.* 1960, July, v. 34, No. 1, 50–51.

Concentration methods for examination of faeces, excellent though they are, have the disadvantage that they are not permanent, require stains not optimal for identification of protozoa and may be laborious.

The authors, from the Kaiser Foundation Hospital, Oakland, California, have used a method in which they mix a small amount of the original faeces with the concentrated material: the resultant combination is stained as a permanent preparation and contains not only the organisms seen in a direct smear but those which would have appeared in a concentrate.

About 1 ml. of faeces is suspended in 10 to 15 times its volume of tap water and strained through 2 layers of wet gauze into a test tube, 1 to 2 ml. of ether are added, the tube is shaken carefully and filled with water to about 1 cm. from the top. The whole is centrifuged at 2,500 r.p.m. for about 45 seconds and when any " plugs " at the top have been broken, the supernatant is decanted. 2 to 3 ml. of normal saline are added, the sediment resuspended by shaking and the tube filled with normal saline to 1 cm. from the top. Centrifugation is repeated, and the supernatant is decanted. A small portion of the original faeces is now mixed with the centrifuged deposit with an applicator to make a homogeneous suspension. The material is spread on a slide which is immersed at once in Schaudinn's fluid and the preparation is stained and mounted in the ordinary way.

The authors use only a trichrome stain [this *Bulletin*, 1952, v. 49, 146], but state that the various iron-haematoxylin methods should work equally well.

The authors make the following points:

(1) Omission of the final zinc sulphate step gives a virtually complete yield of concentrated organisms without the distortion due to hypertonicity.

(2) Concentrated cysts were seen in much greater number than in direct smears.

(3) Use of normal saline in the second centrifugation minimizes the damaging osmotic effect on trophozoites in the faeces which might otherwise occur when the concentrate is added.

(4) Tap water in the first centrifugation eliminates *Blastocystis* and a cleaner concentrate results.

(5) A short exposure to tap water hardly affects protozoan cysts, though of course the trophozoites are destroyed.

(6) Most helminth ova will be readily recognized in the smears prepared by this technique, though some will be considerably distorted. The method is not recommended therefore when the primary interest is the detection of helminth ova. *H. J. O'D. Burke-Gaffney*

MISCELLANEOUS PAPERS

See also p. 137, CHRISTOPHERS, **The Generic Names *Aedes***; MACARTHUR, **The Diaeresis Sign ["] in the Generic Name *Aedes***.

MANSON-BAHR, P. **Then and Now. Memoirs of Colonial Medicine.** *Brit. J. Clin. Practice*. 1960, Jan., Feb., Mar., Apr., June, July & Aug., v. 14, Nos. 1, 2, 3, 4, 6, 7 & 8, 55–6; 129–30, 154; 215–16, 240; 300–301, 324; 482–3; 543–4; 626–7.

Sir Philip has had a unique opportunity of seeing the development of tropical medicine during the past 50 years. In this series of papers he sets down

a number of memories, relating them to changes which have taken place during that time. He refers to the elaborate protection that used to be adopted against the tropical climate and the fears of permitting women and children to face its rigours. The use of quinine as the sole antimalarial and the frequency of blackwater fever in the past are discussed. Much bacillary dysentery in the Near East in the First World War was mistaken for amoebiasis and treated with emetine, and chronic bacillary dysentery was often seen; the difference in the Second World War was striking. Some of the unexpected complications of amoebic dysentery are mentioned and there is an account of sprue at a time when it was common and when there was no specific treatment. The author underlines the importance of microscopic diagnosis in tropical diseases. Intravenous therapy, now so common, was once a formidable undertaking.

The final chapters consist of reminiscences of early days in Fiji, with a lively account of local customs, the country and some of its historic background, local personalities and primitive reactions to Western medicine.

These personal recollections are interspersed with anecdotes in the author's characteristic style and give a vivid picture not only of the tremendous strides made in tropical medicine during this century, but of the difficulties and trials of those who had to practise it when the century was young.

H. J. O'D. Burke-Gaffney

PESSÔA, S. B. Considerações sôbre a importância da geografia médica na medicina tropical e no povoamento das zonas de influência de Brasília. [**Considerations on the Importance of Medical Geography in relation to Tropical Medicine and to the Peopling of the Country around Brasilia**] *Brasil-Médico.* 1960, Jan. 2–30, v. 74, Nos. 1/5, 14–26. French summary.

The creation of a new capital (Brasilia) of Brazil, in the centre of vast undeveloped tracts in the western part of the country obviously required the application of new modes of thinking to the medical problems involved. Medical geography (or global epidemiology, medical ecology, natural history of diseases, as the subject is variously known) provides the answer, and Pessôa —the doyen of Brazilian parasitologists—discusses some of the problems in an inaugural lecture to the Institute of Tropical Medicine of São Paulo. The great Brazilian painter, Portinari, has illustrated some of the rural problems on his canvases; Pessôa takes further examples, and shows how environment can influence infections like syphilis, cutaneous leishmaniasis, schistosomiasis; how a study of the environment may reveal the nature of certain maladies like mega-oesophagus, while the Pavlovskian approach *via* the natural foci of disease may prove of immense value in prophylaxis, *e.g.* in leishmaniasis, filariasis, Chagas's disease, and the arborvirus infections.

The creation of a special organization based on these principles is recommended for the country around the new capital of Brazil.

P. C. C. Garnham

CAMERON, A. **Folk-Lore as a Medical Problem among Arab Refugees.** *Practitioner.* 1960, Sept., v. 185, No. 1107, 347–53, 2 figs.

The author writes from his experience of an Arab refugee camp in Jordan, and he explains that belief in the evil eye is "universally held in the Near East

by people in every walk of life", and the same is true of belief in the generally malignant influence of the race of beings known as the djinn. He describes some of the occasions on which these beliefs become intensely important, and some of the means evolved by believers to counteract the evil effects which might be produced. For the evil eye amulets are much used, and for the djinn various procedures are adopted, some of which indicate the respect thought to be due to these beings. For treatment of disease, cauterization, scarification, cupping, tattooing, binding and application of various medicaments are practised, and amulets are used. Some account of these is given.

The author remarks on the similarity which has been observed in folk-lore of this kind from widely separated parts of the world, and he comments to the effect that such beliefs are not negligible; they are strongly held and pervade the whole of life; and they may materially affect health. They are extremely important. *Charles Wilcocks*

GELFAND, M. **The Mind of the African in Traditional and Western Environment.** *Med. Proc.* Johannesburg. 1960, Aug. 27, v. 6, No. 17, 392–6.

The author writes from Salisbury, Southern Rhodesia, and begins by explaining that the African is brought up in an atmosphere of conformity in which change and innovation are not encouraged. "To be ambitious and rich would mean benefiting at the expense of his neighbours. He wants to be the same as they are." "A twin or a child cutting a tooth in the wrong position is considered unnatural and therefore dangerous."

In their traditional environment the Africans probably experience less mental illness than Western peoples, but hysteria is not uncommon, and many Africans visit different witch doctors time after time, and this suggests visceral neuroses and therefore mental tension. Malnutrition (especially pellagra) is common, and also chronic liver disease—often with encephalopathy. Syphilis and alcoholism are serious problems in both urban and rural Africa. The environment is harsh.

The urban African tends to develop anxiety states but, perhaps because he has a sound emotional make-up, is not particularly subject to stress disorders such as coronary artery disease, thyrotoxicosis, peptic ulcer and ulcerative colitis.

For an estimate of the future experience of the African in relation to mental disorder the author refers to the American Negroes, who suffer more frequently than Europeans from organic psychoses (due to alcohol and syphilis) and functional psychoses (schizophrenia, manic depressive and involutional psychoses). But in America the differences between black and white are environmental and cultural rather than racial; "There is no valid evidence in America today to show that the intelligence of negroes and white people is different and that the variation is not due to environmental factors".

In Africa "the traditional African has found it possible to adapt himself to an urban environment fairly satisfactorily, probably due to the fact that he has not been entirely removed as yet from his culture and religion".

Charles Wilcocks

MARWICK, M. G. **Mental Health Aspects of Social Changes in Africa.** *Med. Proc.* Johannesburg. 1960, Aug. 27, v. 6, No. 17, 384–8.

This is a thoughtful and important paper. In recent times Africa has been subjected to immense economic change involving the adoption of money, and is therefore subjected to the growth of new wants. The result is an expansion of urban life, with increasing departure of Africans from their old patrilineal (or matrilineal) traditions and authorities, which satisfied the mind and did not provoke undue stress. From this secure system of personal relationships the African has been projected into a rootless migrant existence, or into a family life unfamiliar to him. Adjustment is difficult, stresses are new and severe, and emotional insurance built into large kin-groups has gone. The ancestor-cult has been much changed, but beliefs in magic, sorcery and witchcraft have not appreciably declined. Explanation of evil and disease or accident in terms of witches and sorcerers is more interesting, convincing and even satisfying than our microbes will ever be.

These social changes must increase social tensions and the mental effects may be far-reaching, with serious repercussions on health. The author has described the situation but has not prescribed the cure, but the first essential is understanding. *Charles Wilcocks*

BARLOVATZ, A. **When does the Sick Bantu Seek Medical Aid?** *Trop. & Geograph. Med.* Amsterdam. 1959, Dec., v. 11, No. 4, 332–4.

The author writes from Stanleyville, Congo, and after an experience of African practice since 1923. His main point is that the African tends to come for treatment only for those conditions which he thinks can be cured or helped. A newly introduced and successful treatment, therefore, is followed by an increased number of patients with the relevant disease, whereas a disease which is self-curing or unresponsive to treatment does not come to light, and is dealt with by witch doctors. Hospital statistics, therefore, do not give the real incidence of pathological conditions. *Charles Wilcocks*

NORMAN-TAYLOR, W. **Some Principles in the Training of Auxiliary Health Personnel for Work in Tropical Rural Areas.** *Pub. Health.* 1960, Aug., v. 74, No. 11, 413–18.

The author, who was formerly Adviser on Education and Training, WHO Regional Office for Africa, does not believe that in tropical rural areas one person should be expected to combine the functions of dresser and sanitary overseer; these duties should be performed separately and by separate persons, since otherwise the clinical functions will always swamp the others. Teaching should proceed from the known to the unknown, from the disease to the cause rather than from the infecting organism to the disease; "it is the *practical situation*, on the ground, not in the book, that must be the starting point. The student must be presented with the actual problem, a case of such and such a disease, or an insanitary condition, and then shown what to *do*, and, if necessary, told why".

This practical approach is elaborated, and the point is made that auxiliaries should receive very definite standing orders, specifying exactly what they must do. There must be prolonged apprenticeship, but once the dispenser or sanitary overseer is placed in charge of his station his prestige must be built up by the Medical Officer, and every means must be used to keep him interested by revision courses, special news letters or magazines, or other means.

The important thing is to ensure action. *Charles Wilcocks*

REPORTS AND SURVEYS

Poti, S. J., Raman, M. V., Biswas, S. & Chakraborty, B. **A Pilot Health Survey in West Bengal—1955.** *Sankhya.* Calcutta. 1959, Mar., v. 21, Pts. 1/2, 141–204. [10 refs.]

An introduction sets out the defects of normal registration procedure in India, in relation to births, deaths and mortality—well-known communicable diseases like plague and smallpox being a partial exception—and it goes on to quote the Bhore Report of 1943 (of the Health Survey and Development Committee) [this *Bulletin*, 1947, v. 44, 252] on the practical importance of more accurate data in future improvement of health standards. Apart from special investigations—often of chronic rather than acute conditions and over a limited tract of the country—really accurate health statistics must lie many years in the future, however, if they are to be based on complete enumeration on the lines usual in highly developed countries. The Singur Health Survey of 1944 [*Bull. Hyg.*, 1950, v. 25, 535] stands out as a broad survey of general health but it covered only a small and compact area of West Bengal; it has not been extended, doubtless because of the formidable demands on men and money involved. Further pilot studies are justified to find methods of health survey possible on a countrywide scale under present conditions in India; to this end, the West Bengal Health Survey was sponsored by the Indian Statistical Institute. The Institute has almost 30 years' experience of sample studies, including in recent years much of the design and statistical processing for the great National Sample Survey which uses lay investigators, along with a highly skilled inspectorate, to take socio-economic questionnaires into some 1,200–1,500 villages every six months, and into towns and cities also. It seems likely that for many years the National Sample Survey will provide the best available means of gathering reasonably accurate health data over the whole country. This pilot survey is intended to test the usefulness of this approach; as an economy at the stage of evolving appropriate methodology, the pilot study was carried out in conjunction with an enquiry into employment conditions in rural and in urban populations, and there is every prospect that results appreciably more accurate than those presented here could be obtained, given a sample design oriented primarily towards a sample survey of health. Estimates of sampling error are not presented, but in the sample design the entire rural and urban samples were divided into two inter-penetrating and independent sub-samples for which some of the important estimates are given separately. Where the

estimates for the two sub-samples approximate, it is believed that they will be of about the right order and may be treated accordingly. In general, urban results showed greater divergence than did those for rural areas, because of small samples along with greater heterogeneity of conditions, so that more effective stratification will be needed in order to get satisfactory results in towns.

The sample survey covered 1,172 rural households in 72 sample villages, and 566 urban households in 5 sample towns or cities. The questionnaire schedules —reproduced as an appendix—covered: (1) demographic particulars of members of the household, (2) housing and sanitary conditions, (3) composition of the diet, (4) morbidity and medical care, (5) specific details of current pregnancy terminations (reference period 2 weeks for first visit, and period since last visit for subsequent visit—the pilot survey involved 4 visits spread as evenly as practicable over 3 months), and (6) history of past pregnancy terminations for all women who had ever been married. All illnesses of over 3 months' duration were classed as chronic and expressed as a prevalence rate per 1,000 population at an instant of time; those of under 3 months' duration were classed as acute and expressed as the rate of new cases arising in a year per 1,000 population. Prevalence rates for all chronic diseases were 35 per 1,000 for urban and 20 per 1,000 for rural population. The new cases of acute diseases were 423 per 1,000 for urban and 328 for rural population. For the 3 months of the survey and taking all illnesses and injuries together, 100 per 1,000 for rural and 150 for urban population were observed—compared with 790 per 1,000 in 3 months in a survey in the United Kingdom in 1946, the difference being ascribed mainly to a much lower level of health consciousness in Bengal. This non-reporting of minor ailments is regarded as the only really major source of error in assessing total morbidity for all types of illnesses; but misclassification is bound to arise when one attempts to estimate morbidity for individual groups of diseases. An assessment of the validity of the morbidity rates was carried out by obtaining the addresses of 400 out-patients at a Calcutta hospital, and comparing the hospital diagnosis with the results of household canvass (1) by medical practitioners and (2) by lay investigators: medical practitioners missed 6·5% of cases but misclassified 57·3%, while lay investigators missed 11·6% and misclassified 63·1%. Morbidity rates for particular disease groups, then, must be treated with caution in this type of survey, whether conducted by medical or by lay personnel.

Disability—causing confinement to bed or hospital—was reported in 65% of rural cases, with loss of 3·12 days of work per person per year for acute and 4·55 days for chronic illness; and in 73% of urban cases, with loss of 3·36 days of work per person per year for acute and 10·10 days for chronic illness. The 35% of non-disabling illness in urban and 27% in rural population compares with 91% in the 1946 survey in U.K.—again ascribed to lack of recognition of minor illness in India, as are the relatively high figures in Bengal referred to some form of medical care, *viz.* 60% of rural and 68% of urban cases, compared with 40% in U.K. in 1946. Of those not referred to medical care, 41% of rural and urban patients stated that "sickness was not serious", while 33% of rural and 6% or urban patients stated that "medical care was too expensive". About 24% of rural and 20% of urban births were without any form of professional attendance, while 76% of rural and 25% of urban patients were attended by untrained *dhais*. Infant mortality was studied as a useful index of general health conditions as related to nutrition, housing, sanitation,

etc. Among relatively well-nourished classes, infant mortality was 116 for rural and 111 for urban population; among the under-nourished the corresponding rates were 171 and 150. In moderately well-housed urban groups the infant mortality rate was 85 as against 149 in poorly housed groups. Somewhat similar results were obtained for successively poorer socio-economic groups, and while direct causal links are not suggested, all these correlations will clearly be vital in stratification of the population in future health surveys of this type. Infant mortality is also analysed by parity.

Incidence rates for acute disease groups, and prevalence rates for chronic disease groups are given below, along with such figures as can readily be matched up from the table of rates of misclassification by medical and by lay investigators in the admittedly very limited investigations of accuracy of diagnosis in household canvassing already reported; it must be emphasized that lay investigators were used in the pilot survey as a whole, and would surely predominate in any foreseeable countrywide survey in India.

Acute disease groups	Rate per 1,000 population in a year		% misclassified in 400 test cases	
	Rural	Urban	Medical investigator	Lay investigator
I Malaria	46·28	14·19	76·9	62·5
II Dysentery	26·54	36·26	69·2	92·3
III Diarrhoea, enteritis, etc.	40·15	74·10	?45·5	?23·5
IV Other intestinal diseases—typhoid, cholera, helminths, etc.	10·21	23·65		
V Measles, mumps, smallpox, chickenpox ..	25·86	22·07	Other infective and parasitic diseases 45·5	100
VI Common cold, tonsillitis, influenza, fever, pneumonia, bronchitis, other respiratory diseases ..	140·87	179·72	Influenza 41·7 Bronchitis 47·6	54·5 73·9
VII Eye, ear, boil and abscess, cellulitis, dental diseases	25·18	36·26		
VIII Others, *e.g.* anaemias, VD, vascular lesions affecting central nervous system, rheumatic fever, appendicitis, congenital malformations, accidents, etc.	12·93	36·26		
	328·02	422·51		

Chronic disease groups	Prevalence rate per 1,000 population		% misclassified in 400 test cases	
	Rural	Urban	Medical investigator	Lay investigator
I Pulmonary TB	1·68	3·77	100	50·0
II Diseases of the circulatory and nervous systems, *e.g.* arteriosclerotic and degenerative heart diseases, hypertension, diseases of veins, rheumatic fever, psychoneurosis and diseases of nerves ..	3·69	2·52	Circulatory system 50·0	50·0
III Diseases of the eye, ear, skin, bones, joints ..	4·02	5·03	Bones and joints 42·9	28·6
IV Diseases of stomach and duodenum except cancer	2·68	5·87		
V Asthma	3·52	4·61	See allergy, etc. below	
VI Diseases of genitalia, fistula	2·85	4·61	100·0	None in sample
VII Others, *e.g.* VD, cancer, diabetes, avitaminosis, nephritis, congenital and functional diseases, etc.	2·01	8·39	Allergic, endocrine, metabolic and nutritional 22·2	81·8
	20·45	34·8		

The reader is referred to the very full and frank exposition and tabulation of the strengths and weaknesses of this type of survey. Selection of the strong points along with careful stratification in designing wider surveys can certainly add greatly to knowledge of general health in underdeveloped countries.

A. T. A. Learmonth

FRY, E. I. **Health Survey of Children from Rarotonga, Cook Islands. II. Clinical Tests.** *J. Trop. Pediatrics.* London. 1960, Sept., v. 6, No. 2, 55–59. [10 refs.]

Mantoux reactions, blood pressures, pulse and respiration rates, and temperatures are recorded for 159–162 Polynesians of Rarotonga; the environmental conditions of the children with results of a medical examination have been recorded previously [this *Bulletin*, 1960, v. 57, 861].

Comparison of mean values with published data of longitudinal studies in Denver and Minnesota showed significantly higher diastolic pressures and body temperatures in the Polynesian children, but no significant differences in systolic pressures, and pulse and respiration rates. The author believes that these differences may be due to chronic infections, particularly tuberculosis.

Mantoux reactions were positive in all of 64 children over the age of 12 years, and in 71% of 97 children between the ages of 5 and 11 years. Comparison of these figures with previous tuberculin surveys, and one previous radiological survey of 365 Rarotongans [*ibid.*, 1952, v. 49, 447], suggests that the incidence of tuberculosis in the Cook Islands is between 22 per 1,000 and 40 per 1,000.

[Details of technique of Mantoux testing, strength, type and dosage of tuberculin or criteria for a positive reaction, are not stated.] *T. P. Eddy*

SCHAAD, J. D. G. **Epidemiological Observations in Bush Negroes and Amerindians in Surinam.** *Trop. & Geograph. Med.* Amsterdam. 1960, Mar., v. 12, No. 1, 38–46, 1 map. [17 refs.]

During an expedition undertaken in 1952, observations were made on a number of Bush Negroes and Amerindians living in the interior of Surinam. The Bush Negroes, who are descended from runaway slaves, lead a primitive existence in scattered villages of 100 to 500 inhabitants. The total number of Amerindians is only about 300, and they seem to be dying out. They occupy widely scattered villages of 20 to 30 inhabitants.

The percentage of positive reactions to histoplasmin varied from 17 to 36% in Bush Negroes and from 22 to 64% in Amerindians. The Mantoux reaction was positive in 18% of young male Bush Negroes and in 62% of the adults; for females the respective percentages were 16 and 47. Serum tests showed yaws to be prevalent among Bush Negroes and uncommon among Amerindians. Results of the Widal and Weil-Felix tests indicated that typhoid fever and scrub typhus do not occur frequently among the Bush Negroes and that these diseases were not prevalent among the Amerindians to a serious degree during the time of the investigation. All the Amerindians examined had a high spleen index, but the degree of malarial parasitaemia could not be ascertained because most of the blood slides had become spoiled before reaching the laboratory. All of 56 Oajana and 85 Trio Indians belonged to blood group O.

Data regarding the presence of antibodies against yellow fever obtained from this expedition have already been published [this *Bulletin*, 1959, v. 56, 147 and 525]. *G. Covell*

BOOK REVIEWS

ARMED FORCES INSTITUTE OF PATHOLOGY. **Manual of Histologic and Special Staining Technics.** 2nd Edition. pp. ix + 207, illustrated. 1960. New York. Toronto. London: McGraw-Hill Publishing Co. Ltd., McGraw-Hill House, 95, Farringdon Street, E.C.4. [43s.]

The *Laboratory Manual of Special Staining Technics* was written by Mary Francis GRIDLEY, and from it was prepared, by the U.S. Armed Forces Institute of Pathology, the first edition of the present work as a tribute to

her memory. The second edition is now issued in a loose leaf form and it is available commercially instead of remaining restricted as an army manual.

The manual consists of 13 chapters, the first 3 of which are concerned with the preparation of sections, and the remaining 10 with methods for staining them. The subject matter is therefore confined to the requirement of the histologist, as related to health and disease of man. It will prove of particular use to the workers in temperate climates, and less to those in the tropics, whose pathology includes a large parasitological element, and this is scarcely mentioned.

Each chapter contains a description of methods for the preparation of reagents and the steps to be taken to stain the section. These are clearly set forth, usually without any comment, and there is no indication of which method to select for a particular purpose; thus, 24 stains are described for connective tissue, and the worker is assumed to know which one he should adopt. The book is in fact a manual for the bench, and theory is entirely omitted.

A few standard histochemical techniques are described; useful practical hints on section cutting are given; methods for removing formalin, mercury and other pigments are noted; a way of mounting sections on plastic or 35 mm. film is added to the list of classical techniques.

Three coloured plates and one in black and white rather inadequately illustrate the text; such a book requires either complete coloured illustrations or none at all. Perhaps future editions will omit the pictures and include instead some parasitological, entomological and electron microscope techniques to add to its range of interests. *P. C. C. Garnham*

DAVIDSON, G. **Insecticides.**

This book is reviewed on p. 148.

NOTICE

Consideration has from time to time been given to the question whether it would be desirable to include authors' addresses in the headings of abstracts in the *Bulletins* and it has been decided that the additional time and cost involved would not be justified. Subscribers are advised, however, that the Bureau will, on request, notify them of the name and address of the author of the article, or the publisher of the journal, from which an abstract has been made.

The Bureau also deals with enquiries from individual subscribers relating to abstracts which have appeared in the *Tropical Diseases Bulletin* and the *Bulletin of Hygiene*; correct references and the exact nature of the information required should be stated.

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